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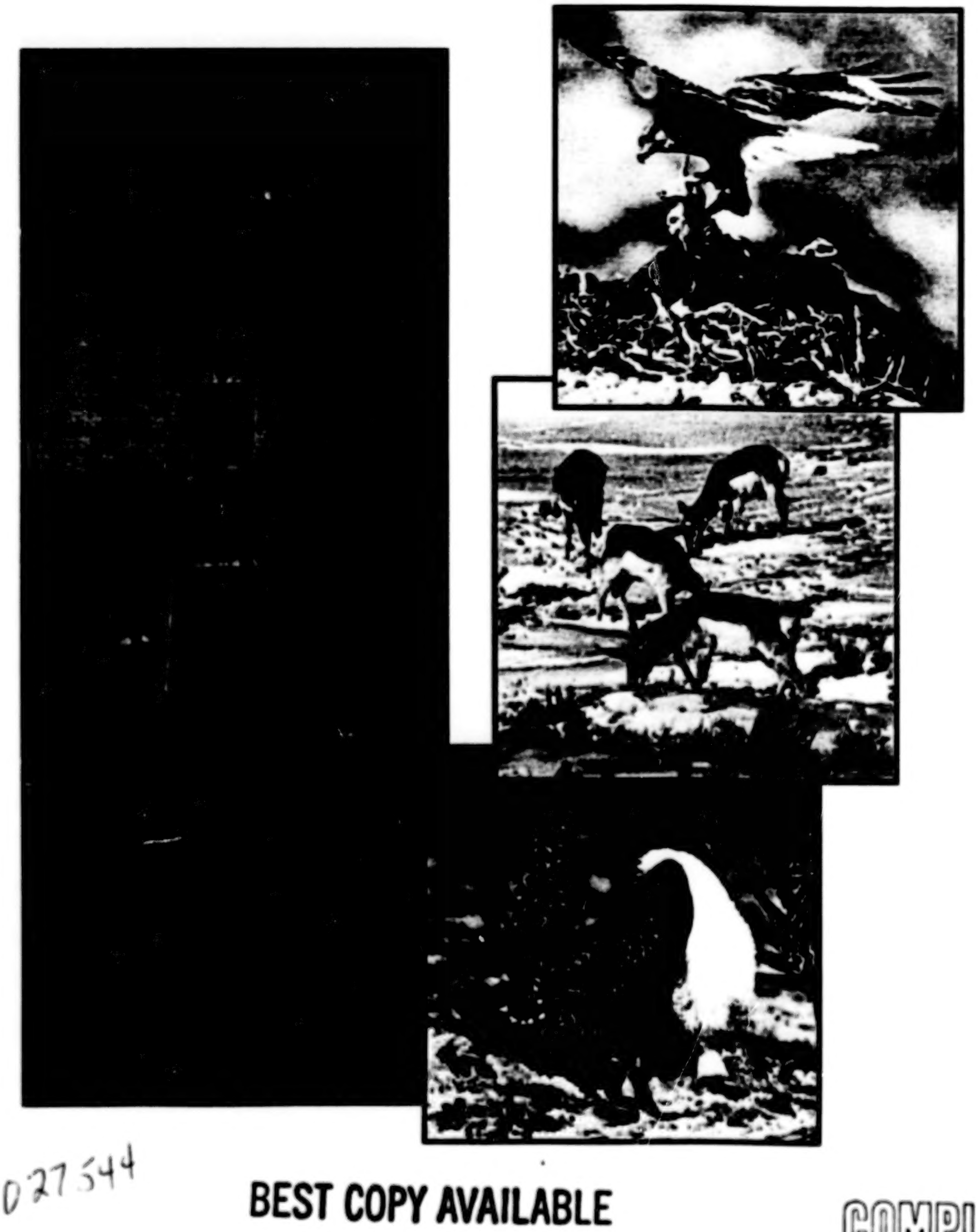
U.S. Department of the Interior

Bureau of Land Management
Rawlins and Rock Springs Field Offices

DES 99-10
April 1999

Draft Environmental Impact Statement
Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming



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MISSION STATEMENT

It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

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DRAFT
ENVIRONMENTAL IMPACT STATEMENT
CONTINENTAL DIVIDE/WAMSUTTER II NATURAL GAS PROJECT, SWEETWATER AND CARBON COUNTIES, WYOMING

Rawlins and Rock Springs Field Offices
Bureau of Land Management
Rawlins and Rock Springs, Wyoming

This Environmental Impact Statement was prepared by TRC Mariah Associates Inc., an environmental consulting firm, with the guidance, participation, and independent evaluation of the Bureau of Land Management (BLM). The BLM, in accordance with 40 C.F.R. 1506.5(a) and (b), is in agreement with the findings of the analysis and approves and takes responsibility for the scope and content of this document.

April 1999

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DRAFT ENVIRONMENTAL IMPACT STATEMENT CONTINENTAL DIVIDE/WAMSUTTER II NATURAL GAS PROJECT, SWEETWATER AND CARBON COUNTIES, WYOMING

(X) Draft ( ) Final

U.S. Department of the Interior
Bureau of Land Management

Abstract:

This draft environmental impact statement (EIS) assesses the environmental consequences of a proposed natural gas development project in eastern Sweetwater County and southwestern Carbon County, approximately 25 mi west of Rawlins and 40 mi east of Rock Springs, Wyoming. Public scoping commenced in March 1995. All issues raised during scoping and Interdisciplinary Team preparation of the analysis were considered. The proposed project entails the drilling, completion, testing, operation, abandonment, and reclamation of natural gas exploration, development, and production operations by Amoco Production Company, Union Pacific Resources Company, Yates Petroleum Corporation, Snyder Oil Corporation, and other operators. The proposed project would use standard procedures as currently employed by other state and regional gas field developments. A maximum of 3,000 well locations (3,000 wells) and associated ancillary facilities, roads, and pipelines would result in the initial disturbance of approximately 22,400 acres on the 1,061,200-acre project area. Numerous standard project-specific and site-specific mitigation measures would be employed to assure that project impacts are minimized on all important resources.

EIS Contact:

Comments on this EIS should be directed to:

Clare Miller
Rawlins Field Office
Bureau of Land Management
P.O. Box 2407
Rawlins, WY 82301-2407

For further information, contact Mr. Clare Miller at the BLM Rawlins Field Office (phone [307] 328-4245) or Ms. Teri Deakins at the Rock Springs Field Office (phone [307] 352-0211).

Date draft EIS made available to Environmental Protection Agency and the public: April 30, 1999.

Date comments on the draft EIS must be received to be considered in the final EIS: July 1, 1999.

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United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Wyoming State Office
P.O. Box 1828
Cheyenne, Wyoming 82003-1828

In Reply Refer To:

1793 (930)

20 APR 1999

Dear Reviewer:

The Draft Environmental Impact Statement (DEIS) on the proposed Continental Divide/Wamsutter II (CD/WII) Natural Gas Project is submitted for your review and comment. This DEIS has been prepared to analyze the potential impacts from natural gas development proposed by Amoco Production Company, Union Pacific Resources Company, Yates Petroleum Corporation, Snyder Oil Corporation, and other natural gas operators (Operators) within the CD/WII project area. The project is generally located 25 miles west of Rawlins and 40 miles east of Rock Springs along Interstate Highway 80, which bisects the project area. This project expands natural gas exploration and development in and adjacent to other oil and gas developments already in the area. Within the boundaries of the project area, there are approximately 845 wells which have been drilled with 631 of these wells completed for production.

The Operators propose a maximum of 3,000 wells at 3,000 well locations be drilled over the next 20 years to recover natural gas from existing Federal, State, and private oil and gas leases. Additional ancillary facilities, roads, and pipelines will be required.

BLM will accept comments on this DEIS for sixty (60) days commencing on the date the Environmental Protection Agency (EPA) publishes its Notice of Availability in the Federal Register. We expect EPA will publish that notice on April 30, 1999.

If you wish to comment on the DEIS, we request you make your comments as specific as possible. Comments will be more helpful if they include suggested changes, sources, or methodologies. Opinions or preferences will not receive a formal response. However, they will be considered and included as part of the BLM decision making process.

Public meetings will be held on Monday, May 24, 1999, in Rock Springs, Wyoming, at the BLM Rock Springs Field Office conference room, 280 Highway 191 North, at 7 p.m., and on Tuesday, May 25, 1999, in Rawlins, Wyoming, at the BLM Rawlins Field Office conference room, 1300 North Third Street, at 7 p.m. The purpose of these meetings is to describe the project, receive verbal comments, and to answer questions you may have regarding the project. In order to make sure everyone has a chance to speak, comments should be limited to 10 minutes. Also, an open house will be held those same afternoons at the same locations from 1:30-4:00 p.m. The purpose of these open house opportunities is to answer any questions you may have about the project prior to the public meetings.

This DEIS was prepared pursuant to the National Environmental Policy Act and applicable regulations and statutes to address possible environmental and socio-economic impacts which could result from the project. The DEIS is not a decision document. Its purpose is to inform the public of the anticipated impacts associated with implementing the Operator's drilling proposal and to evaluate alternatives to the proposal.

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Please retain this document for future reference. A copy of the DEIS has been sent to affected government agencies and to those persons who responded to scoping or otherwise indicated to BLM they wished to receive the document. Copies of the DEIS are available at the following locations:

Bureau of Land Management
Wyoming State Office
5353 Yellowstone Road
Cheyenne, WY 82001
(307 775-6256)

Bureau of Land Management
Rock Springs Field Office
280 Highway 191 North
Rock Springs, WY 82901
(307 352-0256)

Bureau of Land Management
Rawlins Field Office
1300 North Third Street
Rawlins, WY 82301
(307 328-4200)

Comments, including names and street addresses of respondents, will be available for public review at the addresses listed above during regular business hours (7:45 a.m. to 4:30 p.m.), Monday through Friday, except holidays, and may be published as part of the Final EIS. Individual respondents may request confidentiality. If you wish to withhold your name or street address from public review or from disclosure under the Freedom of Information Act, you must state this prominently at the beginning of your written comment. Such requests will be honored to the extent allowed by law. All submissions from organizations or businesses, and from individuals identifying themselves as representatives of officials of organizations or businesses, will be made available for public inspection in their entirety.

Sincerely,

Alan L Kesterke

for Alan R. Pierson
State Director

EXECUTIVE SUMMARY

Amoco Production Company, Union Pacific Resources Company, Yates Petroleum Corporation, Snyder Oil Corporation, and other natural gas operators (collectively known as the Operators) propose to explore for and develop natural gas reserves on the Continental Divide/Wamsutter II Project Area (CD/WIIPA) in eastern Sweetwater County and southwestern Carbon County, Wyoming, in portions of Townships 15 through 23 North, Ranges 91 through 99 West. The U.S. Department of the Interior, Bureau of Land Management (BLM) (Rawlins and Rock Springs Field Offices) have determined that the Operators' proposed project would constitute a major federal action and therefore requires the preparation of an environmental impact statement (EIS) in accordance with the *National Environmental Policy Act of 1969* as amended (NEPA). This draft EIS was prepared in accordance with NEPA to assess the environmental consequences of the Operators' proposed development (i.e., the Proposed Action) and is intended to provide the public and decision-makers with a complete and objective evaluation of impacts, both beneficial and adverse, resulting from the Proposed Action and reasonable alternatives.

The Proposed Action, two alternative development strategies (i.e., Alternative A--14.0-acre maximum surface disturbance per section in sensitive resource areas [SRAs], and Alternative B--30.0-acre maximum surface disturbance per section in SRAs), and a No Action Alternative are analyzed. Additional alternatives including those considering CD/WIIPA-wide well densities/spacing patterns, fewer wells, increased surface disturbance per well, phased development, no development, and development in the Adobe Town Wilderness Study Area were considered but rejected for environmental, economic, and/or legal reasons.

The No Action Alternative analyzed in this EIS would involve the rejection of the Operators' Proposed Action and Alternatives A and B; however, denial of the development alternatives would not constitute a denial of all natural gas development on the area. Since over half of the CD/WIIPA is not federally owned and since the BLM would not deny access to these private- and state-owned lands, nor would the BLM allow the drainage of federal minerals, some development of the CD/WIIPA would occur under the No Action Alternative. For the purpose of this analysis, it is assumed that under the No Action Alternative development of the area would occur at levels similar to those that have occurred in the past. Additionally, the project-specific planning measures identified for the Proposed Action and Alternatives A and B (e.g., Reclamation Plan [Appendix A], Transportation Plan [Appendix B], Wildlife Protection Plan [Appendix D]) would not be implemented under the No Action Alternative. This alternative serves as a benchmark, enabling decision-makers and the public to compare the magnitude of the environmental impacts of the development alternatives.

Public scoping was conducted, with scoping statements mailed to potentially interested parties and the media in March 1995 and May 1997, and public meetings were held. All issues identified during scoping and by a BLM Interdisciplinary Team review were considered during the preparation of this document. The proposed project is in conformance with the BLM Great Divide (Rawlins Field Office) and Green River (Rock Springs Field Office) Resource Area resource management plans, the Sweetwater and Carbon County land use plans, and the State of Wyoming land use plan.

The proposed project is to explore for and develop natural gas and condensate reserves present in the Almond Formation and other formations at depths of approximately 7,000-10,000 ft in the CD/WIIPA. The CD/WIIPA encompasses approximately 1,061,200 acres (531,400 acres federal surface, 9,800 acres state surface, and 520,000 acres private surface). The BLM has determined that CD/WIIPA lands are available for leasing and development for natural gas resources, and previous development for these resources has occurred on the area. Approximately 845 well locations and associated access roads and pipelines currently exist or have been authorized for the CD/WIIPA. Maintenance of existing wells will continue as authorized by existing permits.

Operators propose to construct, drill, complete, operate, and reclaim a maximum of 3,000 new well locations (7,800 acres - 2.6 acres/location) on variable spacing patterns within the CD/WIIPA beginning in

1999, subsequent to the release of the Record of Decision (ROD) for this project, and continuing for an estimated life-of-project (LOP) of 30-50 years. Additional construction activities include a total of approximately 1,500 mi of new or upgraded roads (10,000 acres - 0.5 mi/location), 1,500 mi of new pipelines (4,500 acres - 0.5 mi/location), five compressor stations (20 acres - 4 acres/station), one gas processing facility (30 acres), 10 evaporation ponds (34 acres), 5 disposal wells (35 acres), and 50 water wells (25 acres -0.5 acres/well). Standard procedures as currently used in gas field developments throughout Wyoming would be employed during project development and operations, and all project activities conducted during the LOP would comply with applicable federal, state, and county laws, regulations, and stipulations. Gas from the project would be transported through existing and newly developed pipelines linking natural gas wells with existing regional pipelines in the project area.

Total maximum initial new ground surface disturbance required for the proposed project is estimated to be 22,400 acres for the Proposed Action. LOP disturbance would be approximately 15,900 acres and includes 7,600 acres of existing disturbance since these areas would be required for the project.

It is anticipated that field developments would require 10-20 years, with approximately 150 to 300 wells being drilled per year. The proposed drilling schedule would require an estimated maximum of 15 drill rigs during peak drilling operations. Each drill rig would be operated on a 24-hr basis and require three crews of seven people. As many as 30 people may be at a well location for short periods to conduct specific tasks such as fracturing. It would take approximately 56 days to construct, drill, complete, and tie in each well location. Approximately 13,081 person-years would be required for the project.

Access roads would be constructed, upgraded, and maintained in accordance with the transportation planning process described in the Transportation Plan (see Appendix B) and the Transportation Planning Technical Support Document for this project, and it is anticipated that the average number of project-required round-trips to and from the field during project development would be 300 per day. The estimated average number of round-trips during project operations (production) is approximately 100 trips per day.

Critical elements of the human environment that could be affected by the proposed project include air quality, cultural resources, environmental justice, floodplains, Native American religious concerns, threatened and endangered (T&E) species, hazardous or solid wastes, water quality, wetlands/riparian zones, and wilderness. Potentially significant project-specific adverse impacts to these elements and other resources could occur as follows: surface water resources under any alternative; soils and vegetation on stabilized dunes under the Proposed Action and No Action Alternatives; oil and gas development and resources under any alternative that denies mineral exploration and development of existing leases or extract these resources; recreational users and rural residents that are displaced from the CD/WIIPA; big game and raptor productivity as a result of indirect impacts during project development under the Proposed Action; and visual resources in Visual Resource Management (VRM) Class II areas under the Proposed Action and No Action Alternatives.

The CD/WIIPA has a midcontinental climate with windy conditions, limited rainfall, and long cold winters and is located in the Great Divide and Washakie Basins. The topography is generally comprised of flats, basins, badlands, buttes, and rims, and elevations range from 6,500 to 7,500 ft. Ephemeral drainages north of the Continental Divide flow north to the Great Divide Basin, whereas drainages south of the divide flow to the Green River or Little Snake River. Ground and surface water are variable in quality, and the major uses are for industry and livestock. No significant impacts to ground water resources in the CD/WIIPA are anticipated under any alternative; however, if increased sedimentation and/or salinity results in the loss of proper functioning condition in area drainages or worsened conditions in drainages classified as functionally at risk, significant impacts could result under any alternative.

Since BLM-approved activities must comply with all applicable local, state, tribal, and federal air quality laws, statues, regulations, standards, and implementation plans, significant adverse impacts to air quality are not anticipated to occur from implementation of any of the alternative actions.

Localized short-term increases in carbon monoxide (CO), nitrogen dioxide (NO$_2$), ozone, particulate matter, and sulfur dioxide (SO$_2$) concentrations would occur, but maximum concentrations would be below applicable ambient air quality standards. Similarly, hazardous air pollutant concentrations (to well rig operators) and the related incremental cancer risks at residences (assumed to be located either 1,650 ft (500 meters) from a well or 13,100 ft (4,000 meters) from the gas plant/compressor) would be below significance levels, even at the maximum assumed emission rates.

Although not a regulatory Prevention of Significant Deterioration (PSD) increment consumption analysis, potential direct project impacts would also be below applicable PSD Class I and II increment levels. No significant atmospheric deposition (acid rain) impacts are predicted to occur in sensitive area lakes, including the extremely sensitive lakes in the PSD Class I Mount Zirkel Wilderness Area.

Assuming project and other reasonably foreseeable natural gas compressors oxides of nitrogen (NO$_x$) emission rates of 2 grams/horsepower-hour (g/hp-hr) (which is possible but greater than levels recently permitted by the Wyoming Department of Environmental Quality - Air Quality Division [WDEQ-AQD]), potential exists for a just noticeable change cumulative visibility impact (greater than 1.0 deciview) on a single day at the PSD Class I Rawah Wilderness Area (at 1.68 deciview). Direct project operations (under the Proposed Action or any alterative, including No Action) would not exceed this threshold alone. The visibility impact analysis assumed a 1.0 deciview just noticeable change would be a reasonably foreseeable significant adverse impact, although there are no applicable state or federal regulatory visibility standards. In addition, this predicted visibility impact may be a result of the modeling analysis, where distant hourly optical conditions are assumed to occur simultaneously in each sensitive receptor. Finally, given the reasonable, but conservative, nature of the cumulative air quality impact analysis (e.g., assuming all proposed wells would go into full production for the life of the project and all compressors would operate continuously at the 2 g/hp-hr NO$_x$ emission rate), it is unlikely that a just noticeable change would actually occur at the PSD Class I Rawah Wilderness Area even on a single day due to the cumulative sources combined.

Approximately 150 soil map units occur in the CD/WIIPA, and most have moderate permeability and low productivity. Soil erodibility rates vary, but much of the area has erodibility limitations, most notably at sand dunes, other known windblown deposits, and badland locations. Significant impacts to soils could occur under the Proposed Action if stabilized sand dunes are reactivated; however, with the surface disturbance limitations identified for sand dunes under Alternatives A and B, no significant impacts to soils are anticipated under these alternatives. Under the No Action Alternative, impacts to soils would occur at existing allowable levels, and if stabilized dunes are reactivated significant adverse impacts could result. Further, impacts could be increased from those of the Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts (see Appendices A and B).

Plant cover values in the area are variable on the three dominant vegetation types--Wyoming big sagebrush, greasewood fans and flats, and desert shrub communities. Approximately 110,668 animal unit months are provided in the 26 grazing allotments on the area. Wetlands in the area are limited (<1.0% of the CD/WIIPA), are restricted to drainage bottoms and around impoundments, and would be avoided during project development, where practical. A reclamation plan for the project has been prepared (see Appendix A), and adherence to the reclamation protocol specified in the plan would minimize potential adverse effects to soils, vegetation, and related land uses under the Proposed Action and Alternatives A and B. Since the reclamation plan would not be applied under the No Action Alternative, impacts to vegetation could be increased under this alternative. Further, potential significant impacts could occur from stabilized dune reactivation under the Proposed Action and No Action Alternatives.

Several fossil localities of importance are known to occur within the CD/WIIPA, and additional important fossils are likely to be discovered in the area. Site-specific paleontologic surveys and monitoring would be conducted as necessary to minimize potential adverse impacts to important fossils, and no significant impacts are anticipated under any alternative.

There are currently no mineral development actions proposed for the CD/WIIPA other than oil and gas development and small-scale gravel/aggregate mining operations, nor are other mineral developments anticipated due to lack of availability. Exploration for other minerals may occur on existing CD/WIIPA leases or claims, and potential development of other mineral resources on the CD/WIIPA may be delayed until after the LOP. The development of oil and gas reserves from the CD/WIIPA as proposed by the Operators is consistent with local and regional land use planning decisions for the area; however, the oil and gas reserves extracted from the area would be unavailable for future generations. Denial of oil and gas exploration and development activities would constitute a significant impact since it would be in violation of contractual agreements between the U.S. and lessees.

During the LOP and beyond, the CD/WIIPA would remain suitable for the historic land uses of livestock grazing, wildlife use, and recreation; however, the predominant use of the area would be oil and gas development for the LOP. While no significant impacts to land use are anticipated under any alternative, some recreational users of the CD/WIIPA may be displaced due to the presence of oil and gas developments.

Pronghorn antelope, mule deer, and elk are present on the project area, as is crucial winter habitat for all these species. While direct impacts to big game species are not anticipated to be significant from the Proposed Action, indirect impacts (e.g., displacement due to human activities) could be significant during project development (10 to 20 years). Indirect LOP impacts are not anticipated to be significant. Furthermore, significant cumulative direct and indirect impacts could occur to pronghorn in the Red Desert Herd due to loss of crucial winter habitat; however, under implementation of Alternatives A and B which provide further protection of crucial winter habitat, no significant direct, indirect, or cumulative impacts are anticipated. Impacts to big game under the No Action Alternative could be increased from those of the Proposed Action and Alternatives A and B due to the absence of coordinated wildlife protection efforts (see Appendix D).

Sage grouse leks and raptor nests occur in and adjacent to the area, and monitoring of these important resources would be conducted annually under the Proposed Action and Alternatives A and B to determine the activity status of leks and nests proximal to proposed development sites as specified in the Wildlife Protection Plan for this project (see Appendix D). No significant impacts to sage grouse are anticipated under any potential development alternative. Significant impacts to raptors could occur under implementation of the Proposed Action from nest abandonment and/or reproductive failure; however, under implementation of Alternatives A and B, no significant impacts are anticipated. Impacts to raptors and sage grouse under the No Action Alternative could be increased from those of the Proposed Action and Alternatives A and B due to the absence of coordinated wildlife protection efforts (see Appendix D).

Potential impacts to wild horses under the Proposed Action and alternatives are not anticipated to be significant.

T&E species that may occur on the area include black-footed ferret, bald eagle, peregrine falcon, and Ute ladies' tresses as described in the Biological Assessment for this project (see Appendix E). In addition, swift fox and mountain plover, proposed threatened species, potentially occur on the area, and four T&E fish species--Colorado squawfish, humpback chub, bonytail chub, and razorback sucker--occur downstream in the Green River/Colorado River drainage. No adverse effects to these species or significant impacts to state sensitive species are anticipated from project development under any alternative.

Potential adverse impacts to cultural resources would be mitigated through data recovery and/or avoidance of significant properties. Site-specific surveys for cultural resources would be conducted prior to disturbance, and formal Wyoming State Historic Preservation Office consultation would occur where cultural resource properties may be impacted. If eligible cultural properties are found within the CD/WIIPA and they cannot be avoided, a data recovery program would be implemented. No significant impacts are anticipated under any alternative.

No sites of Native American religious or cultural importance are known to occur on the CD/WIIPA, and continued consultation with potentially affected Native American tribes would occur as necessary to ensure all such sites are identified. If sites or localities of religious and/or cultural importance are identified, coordinated efforts would be made to ensure adequate site protection. No significant impacts are anticipated under any alternative.

Communities most likely to be affected by the proposed project are Wamsutter and Rock Springs in Sweetwater County and Rawlins in Carbon County. Socioeconomic impacts to these cities and counties are anticipated to be primarily beneficial, with total increased salaries estimated at $33-$66 million per year during the 10-20 years of project development and total government revenues estimated at approximately $2.7 billion for the first 25 years of the project. Significant adverse effects to rural residential areas could occur under the Proposed Action if area residents are displaced. Under the No Action Alternative, the economic benefits of the action alternatives would not be realized, and significant adverse impacts could occur by foregoing revenue generation.

Most of the CD/WIIPA occurs within VRM Class III and IV areas, and the Proposed Action is consistent with VRM management objectives for these areas. However, 22,600 acres of the CD/WIIPA occurs within VRM Class II areas, and development in these areas under the Proposed Action could result in a significant change in landscape character. No significant impacts to visual resources are anticipated under Alternatives A or B since surface disturbance limitations would be applied in VRM Class II areas. Under the No Action Alternative, impacts to visual resources would continue at existing authorized levels; however, impacts could be increased from those of the Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts (see Appendices A and B). Visual resource impacts would be mitigated under all development scenarios by locating and painting aboveground facilities to blend with the natural landscape. Nonetheless, the landscape character of the CD/WIIPA would change from relatively undeveloped to an active oil and gas field for the LOP and until reclamation is successful.

Numerous standard project-specific and site-specific mitigation measures would be employed during all phases of the project to assure that potential impacts are minimized. Site-specific measures would be applied as specified in approved Applications for Permit to Drill and rights-of-way applications for each new project feature. Surveys and/or monitoring would be conducted for cultural resources, paleontological resources, raptor nests, sage grouse leks, threatened, endangered, candidate, and special status species, and reclamation areas to document their status relative to specific disturbance activities. Reclamation would be conducted as soon as possible on areas disturbed during initial construction that are not required for the LOP. Upon completion of the project, all wells would be plugged and abandoned, surface facilities would be removed, and most disturbed areas would be reclaimed and revegetated.

This EIS presents the BLM's analysis of environmental impacts under the authority of NEPA and associated rules and guidelines. The BLM will use this analysis to make a decision regarding the continued authorization of construction, drilling, completion, operation, and reclamation activities as proposed by the Operators for exploration and development of natural gas in the CD/WIIPA. The decision to allow development of CD/WIIPA lands was made in the Great Divide and Green River Resource Management Plans, where it was determined that CD/WIIPA lands were available for leasing.

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ABBREVIATIONS AND ACRONYMS

°F	Degrees Fahrenheit
μg	Micrograms
$\mu g/m^3$	Micrograms per cubic meter
$\mu eq/l$	Microequivalents per liter
AACL	Acceptable Ambient Concentration Levels
ACEC	Area(s) of Critical Environmental Concern
ADT	Average Daily Traffic
acre-ft	Acre-foot/feet
Amoco	Amoco Production Company
ANC	Acid neutralizing capacity
APCD	Air Pollution Control Division, Colorado Department of Public Health and Environment
APD	Application for Permit to Drill
APLIC	Avian Power Line Interaction Committee
AQD	Air Quality Division
AQRV	Air Quality-Related Values
ARPA	*Archaeological Resource Protection Act of 1979*
ATV	All-terrain vehicle
AUM	Animal unit month
BA	Biological Assessment
BACT	Best available control technology
bbls	Barrels
bcpd	Barrels of condensate per day
BLM	Bureau of Land Management
B.P.	Before present
bpd	barrels per day
CD/WIIPA	Continental Divide/Wamsutter II Project Area
CDPHE	Colorado Department of Public Health and Environment
CEQ	Council on Environmental Quality
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
C.F.R.	Code of Federal Regulations
cfs	Cubic feet per second
CIAA	Cumulative impact assessment area
CIG	Colorado Interstate Gas
CO	Carbon monoxide
CO_2	Carbon dioxide
COE	U.S. Army Corps of Engineers
dB	Decibel
dBA	A-weighted decibel
DEIS	Draft environmental impact statement
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EA	Environmental assessment
EIS	Environmental impact statement
EPA	U.S. Environmental Protection Agency
FAR	Functioning-at-risk
FEMA	Federal Emergency Management Agency
FLPMA	*Federal Land Policy and Management Act of 1976*
ft	Foot or feet
g/hp-hr	Grams per horsepower-hour
$\mu g/m^3$	Micrograms per cubic meter
gal	Gallon
GCIAA	General Cumulative Impact Assessment Area
GDRA	Great Divide Resource Area
GHEP	Gary Holsen Environmental Planning
GIS	Geographic Information System
gpm	Gallons per minute
GRBAC	Green River Basin Advisory Council
GRRA	Green River Resource Area
H_2S	Hydrogen sulfide
HAP	Hazardous air pollutant
hp	Horsepower
hr	Hour
I-80	Interstate 80
IDT	Interdisciplinary Team
IMPROVE	Interagency Monitoring of PROtected Visual Environments
IWAQM	Interagency Workgroup on Air Quality Modeling
KRCRA	Known Recoverable Coal Resource Area
l	liter
lb(s)	Pound(s)
LOP	Life-of-project
LQD	Land Quality Division
m	Meter(s)
mbo	Million barrels of oil
mcf	Thousand cubic feet
MCIAA	Minerals Cumulative Impact Assessment Area
MEI	Maximally exposed individual
MFP	Management Framework Plan
mg	Milligram

mi	Mile(s)
MLE	Most likely exposure
mmcf	Million cubic feet
mmcfd	Million cubic feet per day
MOU	Memorandum of Understanding
mph	Miles per hour
MSDS	Material Safety Data Sheet
N_2	Nitrogen
NAAQS	National Ambient Air Quality Standards
NCPA	National Cultural Programmatic Agreement
n.d.	No date
NEPA	*National Environmental Policy Act of 1969* (as amended)
NHPA	*National Historic Preservation Act of 1966*
NF	Nonfunctional
NO_x	Oxides of nitrogen
NO_2	Nitrogen dioxide
NOI	Notice of Intent
NOS	Notice of Staking
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NSO	No Surface Occupancy
NTL	Notice to Lessees
Operators	Amoco Production Company, Union Pacific Resources Company, Yates Petroleum Corporation, Snyder Oil Corporation, and other companies
ORV	Off-road vehicle
OSHA	Occupational Safety and Health Administration
PFC	Proper functioning condition
Pub. L.	Public Law
$PM_{2.5}$	Particulate matter less than 2.5 microns in effective diameter
PM_{10}	Particulate matter less than 10 microns in effective diameter
ppm	Parts per million
PSD	Prevention of Significant Deterioration
RCA	Raptor concentration area
RCRA	*Resource Conservation and Recovery Act of 1976*
RDP	Road Development Plan
RFO	Rawlins Field Office
RMP	Resource management plan
ROD	Record of Decision
ROW	Right-of-way
RSFO	Rock Springs Field Office
RV	Recreational vehicle
SARA	*Superfund Amendments and Reauthorization Act of 1986*
SCS	U.S. Soil Conservation Service
SHPO	State Historic Preservation Office
Snyder	Snyder Oil Corporation
SO_2	Sulfur dioxide
SPCC Plan	Spill Prevention, Control, and Countermeasure Plan
SRA	Sensitive resource area
SWEDA	Sweetwater County Economic Development Association
SWPP Plan	Stormwater Pollution Prevention Plan
T&E	Threatened and endangered
tcf	Trillion cubic feet
TDS	Total dissolved solids
TEC&SC	Threatened, endangered, candidate, and other species of concern
THK	THK Associates, Inc.
TP	Transportation Plan
TPTSD	Transportation Planning Technical Support Document
TPQ	Threshold planning quantity
tpy	Tons per year
TRC Mariah	TRC Mariah Associates Inc.
TSP	Total suspended particulate matter
UGBMA	Upland Game Bird Management Area
UP	Union Pacific
UPRC	Union Pacific Resources Company
U.S.C.	United States Code
USDA	U.S. Department of Agriculture
USDI	U.S. Department of the Interior
USDOC	U.S. Department of Commerce
USFS	U.S. Department of Agriculture, Forest Service
USFWS	U.S. Fish and Wildlife Service
UW	University of Wyoming
USGS	U.S. Geological Survey
VOC	Volatile organic compounds
VRM	Visual Resource Management
WAAQS	Wyoming Ambient Air Quality Standards
WDEQ	Wyoming Department of Environmental Quality
WDOC	Wyoming Department of Commerce
WDOE	Wyoming Department of Employment

WDOT	Wyoming Department of Transportation
WDR	Wyoming Department of Revenue
WESTAR	Western States' Air Resource Council
WGFD	Wyoming Game and Fish Department
WHHMA	Wild Horse Herd Management Area
WNDDB	Wyoming Natural Diversity Database
WOGCC	Wyoming Oil and Gas Conservation Commission
WQD	Water Quality Division
W.S.	Wyoming Statute
WSA	Wilderness Study Area
WSEO	Wyoming State Engineer's Office
WSLUC	Wyoming State Land Use Commission
WSP	Wyoming State Protocol
Yates	Yates Petroleum Corporation

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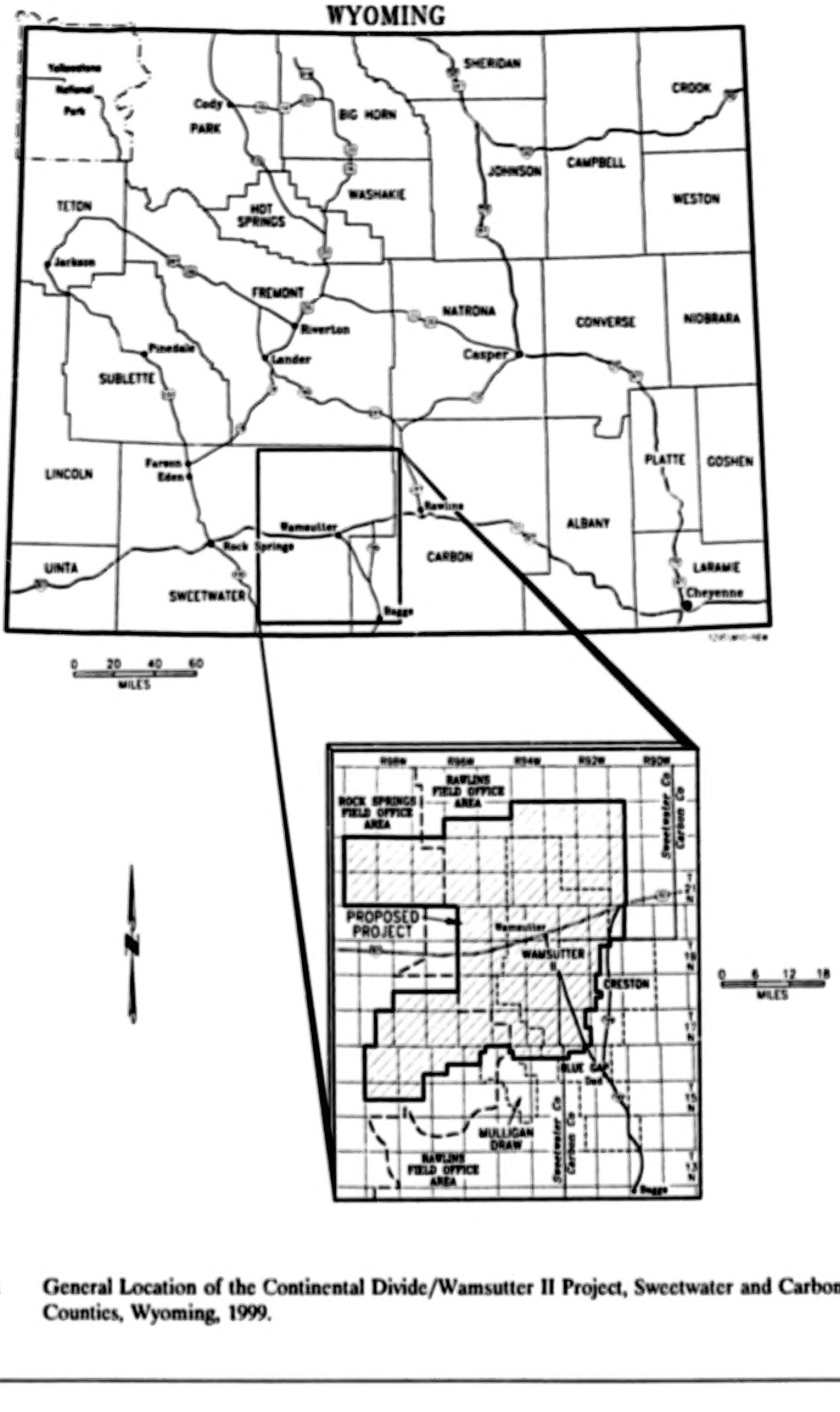
1.0 INTRODUCTION

Amoco Production Company (Amoco), Union Pacific Resources Company (UPRC), Yates Petroleum Corporation (Yates), Snyder Oil Corporation (Snyder), and other companies (hereafter referred to as the "Operators") have notified the U.S. Department of the Interior (USDI), Bureau of Land Management (BLM) that they intend to expand natural gas exploration and development in and adjacent to other oil and gas developments including the Greater Wamsutter Area II, Creston/Blue Gap, Table Rock Field, Hay Reservoir, Patrick Draw, and Mulligan Draw (Map 1.1). The proposed project area would include the Continental Divide Area combined with the Greater Wamsutter Area II and is referred to as the Continental Divide/Wamsutter II Project Area (CD/WIIPA). The CD/WIIPA is located generally in Townships 15 through 23 North, Ranges 91 through 99 West of Sweetwater and Carbon Counties, Wyoming, and encompasses approximately 1,061,200 acres of which 531,400 acres are federal, 9,800 acres are state, and 520,000 acres are private surface (Map 1.2). The CD/WIIPA is located approximately 25 mi west of Rawlins and 40 mi east of Rock Springs along Interstate Highway 80 (I-80), which runs east/west bisecting the area.

Scoping (i.e., issue identification) for the Continental Divide Natural Gas Project was originally conducted in March 1995, and preparation of an Environmental Impact Statement (EIS) was initiated. Scoping for the Greater Wamsutter Area II Project was originally conducted in December 1993 and the draft and final EISs and Record of Decision (ROD) were issued in 1995 (BLM 1995a, 1995b, 1995c). Development within the Greater Wamsutter Area II has reached the levels analyzed in the EIS for that project (i.e., 300 well locations). Since directional drilling has proved to be technically impractical or uneconomical in many areas, additional well locations beyond those analyzed in the Greater Wamsutter Area II EIS are required. The expansion of development in the Greater Wamsutter II Area and development in the Continental Divide Area are combined in one analysis because it will reduce the level of effort required to comply with the *National Environmental Policy Act of 1969* (as amended) (NEPA) (42 *United States Code* [U.S.C.] 4321 et seq.) and will facilitate cumulative impacts analysis.

The proposed Continental Divide/Wamsutter II Project is located on lands administered by the BLM Rawlins Field Office (RFO) (formerly the Great Divide Resource Area [GDRA] Rawlins District), and the Rock Springs Field Office (RSFO) (formerly the Green River Resource Area [GRRA] Rock Springs District). The CD/WIIPA is located primarily within the checkerboard land pattern that resulted from early railroad grants made by the federal government to the Union Pacific Railroad Company. Most odd-numbered sections within 20 mi of each side of the railroad mainline are privately owned (surface and mineral rights) (Map 1.2). The State of Wyoming also owns the surface and mineral rights to approximately 16 sections in the area, and the mineral rights to only approximately 75 more sections. Thus, approximately 50% of the surface and 55% of the mineral estate within the CD/WIIPA is not managed by the BLM, and the BLM has limited regulatory jurisdiction on development of these private and state lands and minerals. Further, the BLM cannot deny ingress and egress to the nonfederal inholdings. The BLM's policy concerning access to oil and gas reserves on nonfederal lands is contained in BLM Manual 2800.06D, release 2-224 (May 15, 1985). This policy directs the BLM to allow access to nonfederally owned land surrounded by public land managed under the *Federal Land Policy and Management Act of 1976* (FLPMA) to allow owners the reasonable use and enjoyment of their lands. Ingress and egress need not necessarily require the highest degree of access, but rather a degree of access commensurate with the reasonable use and enjoyment of the land. The access necessary for the reasonable use and enjoyment of the nonfederal land cannot be denied so long as the landowner complies with BLM rules and regulations.

This analysis provides specific detail and alternative examination for the proposed development on the 531,400 acres of federal surface and 474,100 acres of federal mineral in the CD/WIIPA. The planned development on the 529,800 acres of private and state surface and 587,100 acres of nonfederal mineral is also considered part of the proposed project, since development on private and state lands would likely occur in association with federal land development. Impacts from all development in the CD/WIIPA are analyzed in Chapter 4.0 of this EIS. Oil and gas



Map 1.1 General Location of the Continental Divide/Wamsutter II Project, Sweetwater and Carbon Counties, Wyoming, 1999.

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development and permitting activities proposed on private and state lands would be administered under Wyoming Oil and Gas Conservation Commission (WOGCC) rules and regulations (WOGCC 1998). Surface disturbance, reclamation, and mitigation measures on private and state land are typically subject to landowner preferences.

Initial activities in unexplored portions of the CD/WIIPA could involve exploratory drilling and reservoir characterization at one well per 640 acres. Unexplored areas are currently authorized by the WOGCC for one well per 160 acres (four wells per section). Additional wells on a 320-acre, 160-acre, or 80-acre pattern could then be drilled to develop fields with economic potential. Well densities would be dictated by reserves, economics, and WOGCC approval. Development of the CD/WIIPA is not expected to exceed a well density pattern of 80 acres (i.e., eight wells per section).

Based on the Operator's current knowledge of natural gas reservoir characteristics (e.g., geology, flow data from existing wells, expected recovery rates, and economics), Operators anticipate maximum field development in the CD/WIIPA to involve drilling and developing up to 3,000 wells on 3,000 well locations (estimated at 1,500 on federal lands and 1,500 on private and state lands), depending on the outcome of continued exploration and reservoir characterization. Area Operators currently anticipate that fewer than 3,000 wells and/or well locations may be necessary for full field development. The construction of various facilities (roads, pipelines, water wells, disposal wells, evaporation ponds, compressor stations, etc.) would also occur in association with the development of these well locations.

All development features and related impacts and mitigations necessary to maximize mineral resource recovery while minimizing disturbance are presented in this EIS. Since Operators have identified the potential for a maximum of 3,000 well locations and associated facilities in the CD/WIIPA, the BLM believes it prudent to analyze impacts associated with this level of development.

Standard operating procedures currently used in gas field developments throughout Wyoming and the surrounding region would be employed during this project. Activities conducted during project development, operation, and abandonment would comply with applicable federal, state, and county laws, rules, and regulations. Numerous standard project- and site-specific mitigation measures would be employed during all phases of the project to minimize potential impacts to the environment. Reclamation would be conducted as soon as practical on disturbed areas. Upon project completion, all wells would be plugged and abandoned, surface facilities would be removed, and most disturbed areas would be reclaimed and revegetated.

The federal action requiring preparation of this EIS involves the continued processing of Applications for Permits to Drill (APDs), rights-of-way (ROWs), and temporary use permits on the federally owned surface and minerals. The decision the BLM will make as a result of the analysis presented in this EIS is whether to allow, and under what conditions to allow, the development, operation, maintenance, and reclamation of a maximum of the approximately 1,500 well locations and associated facilities on federal land.

On reviewing the Operators' plans, the BLM has determined that permitting this project would constitute a major federal action that could significantly affect the quality of the human environment. Pursuant to NEPA and the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 *Code of Federal Regulations* [C.F.R.] 1500-1508), the BLM has required the preparation of this EIS to describe and evaluate the probable impacts of the Proposed Action and other reasonable alternative actions. This document has been prepared in compliance with NEPA, CEQ regulations, USDI environmental quality guidelines (USDI 1980), and BLM NEPA guidelines (BLM 1988a).

This EIS was prepared by a third-party contractor (TRC Mariah Associates Inc. [TRC Mariah]) who was selected by and is working under the direction of the BLM. The BLM (RFO and RSFO), as the lead agency, has provided guidance, input, participation and independent evaluation during EIS preparation. The BLM, in accordance with 40 C.F.R. 1506.5(a) and (b), is in agreement with the information and analyses presented in this EIS and approves and takes responsibility for the scope and content of this document.

The purpose of this EIS is to provide the public and decision-makers with sufficient information to understand the environmental consequences of implementing the Proposed Action or alternatives. The analyses proposed in this EIS were also used to identify and develop appropriate mitigation measures to minimize environmental impacts.

If the decision is made to allow development of the federal gas reserves, several site-specific plans would be prepared, including APDs, ROW authorizations, and temporary use permits. Each well proposed on federal land would require, according to Onshore Oil and Gas Order Nos. 1 and 2, an APD approved by BLM prior to any surface disturbance. Each APD would contain site-specific information regarding all facets of well development, including environmental concerns. Access roads, power lines, and pipelines associated with this project which cross federal surface outside of existing unit or lease boundaries would require separate ROW authorizations from the BLM. Therefore, site-specific project components presented in this EIS would have environmental assessments (EAs) prepared for each APD and ROW application.

1.1 PURPOSE AND NEED

The purpose of the proposed project is to enable the commercial production of federally owned natural gas by private companies, pursuant to their rights under existing oil and gas leases issued by the BLM, and to prevent drainage of federal minerals by adjacent wells on non-federally owned lands. National mineral leasing policies and the regulations by which they are enforced recognize the statutory right of lease holders to develop federal mineral resources to meet continuing national needs and economic demands as long as undue environmental degradation is not incurred. Private- and state-owned gas would likely be developed regardless of the development on federal lands.

Natural gas is an integral part of the U.S. energy future due to its availability and the presence of an existing market delivery infrastructure. By developing domestic reserves of clean-burning natural gas, the U.S. would reduce dependence on foreign sources of energy and maintain an adequate and stable supply of fuel to maintain economic well-being, industrial production, and national security. The environmental advantages of burning natural gas are emphasized in the *Clean Air Act* amendments of 1990.

1.2 RELATIONSHIP TO POLICIES, PLANS, AND PROGRAMS

The regulatory framework that governs oil and gas leasing, drilling, production, and abandonment involves a complicated mosaic of policies, legislation, and regulations. The proposed project must be reviewed in accordance with requirements of BLM Onshore Oil and Gas Order Nos. 1 through 7 (43 C.F.R. 3164), NEPA and applicable regulations and guidelines (40 C.F.R. 1500-1508), and BLM Handbook H-1790-1 (BLM 1988a).

The following sections provide a summary of the processes required for oil and gas development on federal lands or mineral estates. The information is provided for those readers that may not be fully aware of the level of analyses necessary for oil and gas developments.

1.2.1 National Environmental Policy Act

NEPA (42 U.S.C. 4321 et seq.) requires that all federal actions be reviewed to determine their probable environmental impacts and to consider alternative measures to counter adverse effects. NEPA requires full disclosure of any federal action significantly affecting the quality of the human environment. The application of NEPA to oil and gas activities can occur at various stages of development. Past court decisions have stated that unless surface-disturbing activities may be absolutely precluded, an EIS must be completed before the government makes an irretrievable commitment of resources (*Connor v. Burford*, 848 F.2d 1441, 1451 [9th Cir. 1988] *cert. denied sub nom. Sun Exploration and Production Co. v. Lujan*, 109 S. Ct. 1121 [1989]). When development plans become sufficiently concrete such that site-specific impacts may be considered, then the need for an EIS--evaluating both the past and future environmental effects of the site-specific drilling, as well as the cumulative effects of drilling a particular site in light of other regional development--may be triggered (*Park County Resource Council, Inc. v. United States Department of Agriculture*, 817 F.2d 609, 623 [10th Cir. 1987]).

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The primary purpose of an EIS is to provide appropriate environmental information to public officials and citizens before permitting decisions are made and actions are taken. The EIS also provides the regulatory authorities with information necessary to make decisions regarding other permits required for this project.

1.2.2 Federal Policy on Mineral Development

Private exploration and development of federal minerals is authorized and encouraged by the *Mineral Leasing Act of 1920*, (30 U.S.C. 181 et seq.) as amended and supplemented by the *Combined Hydrocarbon Leasing Act of 1981* (Public Law [Pub. L.] 97-78) and the *Federal Onshore Oil and Gas Leasing Reform Act of 1987* (Pub. L. 100-203); the *Mineral Leasing Act for Acquired Lands of 1947*, as amended (30 U.S.C. 351-360); the *Mining and Minerals Policy Act of 1970* (30 U.S.C. 21a); FLPMA, as amended (43 U.S.C. 1701 et seq.); the *National Materials and Mineral Policy Research and Development Act of 1980*, as amended (30 U.S.C. 1601 et seq.); and the *Federal Oil and Gas Royalty Management Act of 1982* (30 U.S.C. 1701 et seq.). The proposed project must be consistent, where applicable, with these acts, among others.

The BLM also has specific provisions it must adhere to regarding the draining of federal minerals from adjoining nonfederal lands. These provisions are codified in 43 C.F.R. 3100.2 which states that, upon determination that lands owned by the U.S. are being drained of oil or gas by wells drilled on adjacent lands, the Authorized Officer may execute agreements with the owners of adjacent lands whereby the U.S. and its lessees shall be compensated for such drainage. In addition, where lands in any lease are being drained of their oil and gas content by wells either on another federal lease issued at a lower rate of royalty or on nonfederal lands, the lessee shall both drill and produce all wells necessary to protect the leased lands from drainage. In lieu of drilling necessary wells, the lessee may, with the consent of the Authorized Officer, pay compensatory royalty. These provisions are also incorporated into *Section 4 - Diligence, rate of development, unitization, and drainage* in the lease terms contained in all federal oil and gas leases (Form 3100-11).

1.2.3 General Phases of Oil and Gas Development

The process of developing a producing oil and gas field on BLM-administered public lands involves several phases which are interwoven with numerous policies, plans, and programs. The decision process is designed to accommodate the uncertainty of geologic, technical, and economic criteria associated with oil and gas exploration and development. Oil and gas exploration is costly and highly speculative. Exploration activities are conducted on only about one out of 10 federal leases issued, and development activities are conducted on only one out of 10 of those leases on which exploration activities have been approved and completed (*Park County Resource Council*, 817 F.2d at 623). Approximately 75% of all wells drilled in the CD/WIIPA have been completed for production (631 of 845 wells), and given present market conditions and known geologic information, it is estimated that approximately 75% of all proposed wells would be completed for production. In *Park County* the court held that an EIS is not required at the leasing stage, but recognized that an EIS would be required at some point during the development of the field (*Park County Resource Council*, 817 F.2d at 623). Thus, if a lease is explored and preliminary data indicate that field development is probable, the BLM must prepare an appropriate NEPA document (typically an EIS) to analyze and disclose the probable environmental impacts, including cumulative impacts of the project in combination with past, present, and reasonably foreseeable future developments.

This regulatory framework provides for public disclosure at the following decision points: (1) the determination of lands administratively available for leasing; (2) the decision to allow geophysical exploration; (3) the decision to lease specific lands; (4) the decision to issue individual APDs for exploration; (5) the decision to allow full field development; and (6) the decision to issue individual APDs for field development (Figure 1.1). Each of these decisions is based on a NEPA analysis--either an EA or EIS.

1.2.4 Land Use Planning

The first phase of oil and gas activity is initiated by the BLM by making an area-wide leasing decision to

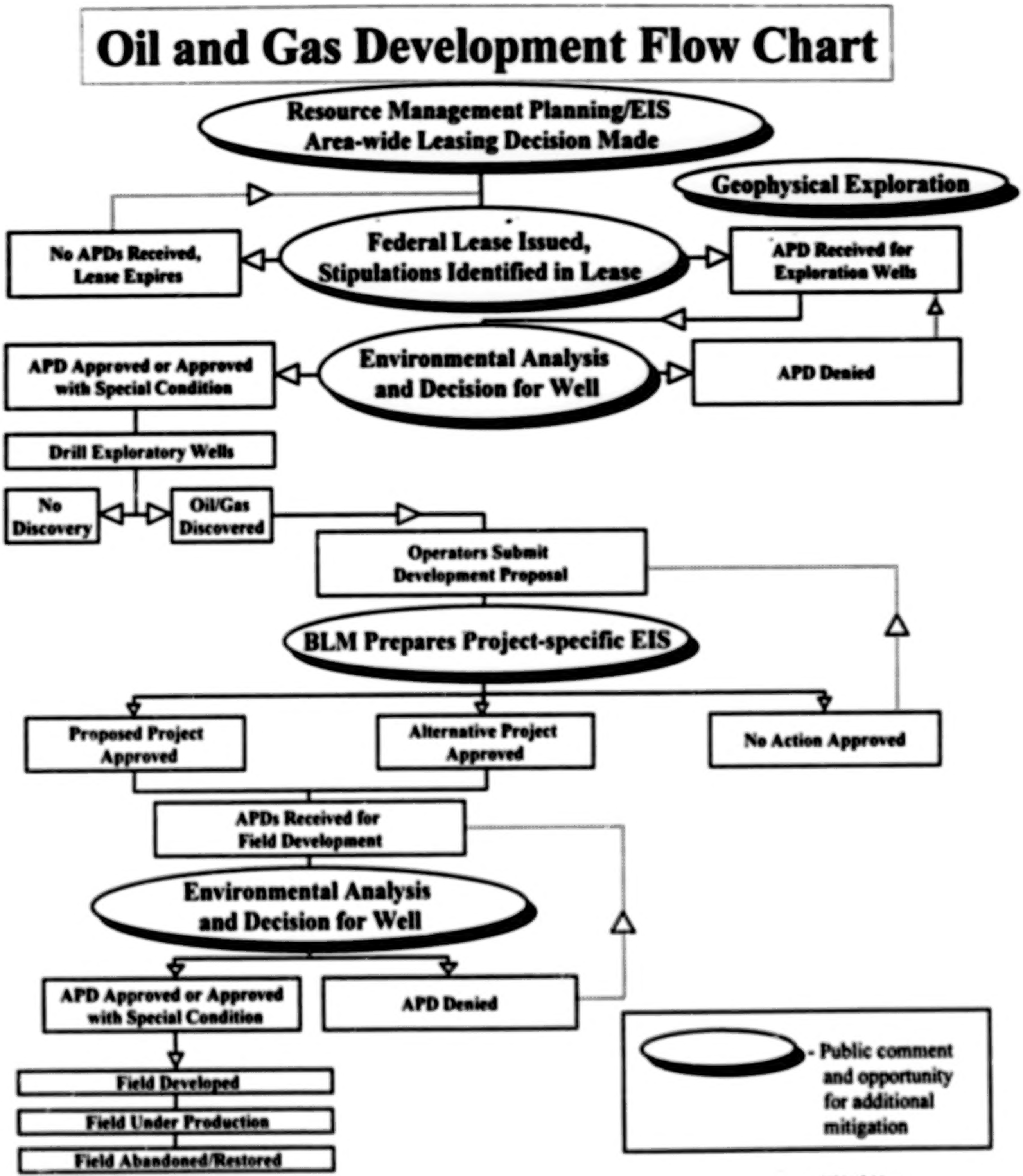
Oil and Gas Development Flow Chart
Resource Management Planning/EIS Area-wide Leasing Decision Made
Geophysical Exploration
No APDs Received, Lease Expires
Federal Lease Issued, Stipulations Identified in Lease
APD Received for Exploration Wells
APD Approved or Approved with Special Condition
Environmental Analysis and Decision for Well
APD Denied
Drill Exploratory Wells
No Discovery
Oil/Gas Discovered
Operators Submit Development Proposal
BLM Prepares Project-specific EIS
Proposed Project Approved
Alternative Project Approved
No Action Approved
APDs Received for Field Development
Environmental Analysis and Decision for Well
APD Approved or Approved with Special Condition
APD Denied
Field Developed
Field Under Production
Field Abandoned/Restored
- Public comment and opportunity for additional mitigation

Figure 1.1 Oil and Gas Development Flow Chart, Continental Divide/Wamsutter II Project, Sweetwater and Carbon Counties, Wyoming, 1999.

designate lands that are administratively available for leasing. This decision is normally documented for each BLM Resource Area (i.e., Field Office area) in a Resource Management Plan (RMP).

Policies for mineral development and land use decisions on eastern portions of the CD/WIIPA are contained in the GDRA RMP EIS (BLM 1987a, 1988b) and subsequent ROD (BLM 1990a). The specified objective for oil and gas resources, as detailed in the GDRA RMP, is to provide for leasing, exploration, and development of oil and gas while protecting other resource values. The entire GDRA RMP planning area (now referred to as the RFO area), excepting wilderness study areas (WSAs), was thus made available for oil and gas leasing subject to Wyoming BLM standard mitigation guidelines. BLM management objectives for oil and gas in the GRRA (now referred to as the RSFO area) (western portion of CD/WIIPA) are provided in the GRRA RMP (BLM 1992, 1996a, 1997a) and include continued leasing, exploration, and development while protecting other values. Standard stipulations are to be applied to open leasing areas, and special stipulations are to be applied in environmentally sensitive situations. The GRRA RMP calls for keeping the entire area (except for areas immediately adjacent to Rock Springs and WSAs) open to oil and gas leasing subject to appropriate surface protection and rehabilitation stipulations, the processing of all APDs in a timely manner, and the continuation of development of surface protection and rehabilitation plans for all producing oil and gas fields and units. Execution of the Proposed Action or alternatives presented in this EIS is consistent with the management decisions presented in the GDRA and GRRA RMP/EISs.

Reasonably foreseeable development for oil and gas activity within the RSFO area as described in the GRRA RMP/EIS (BLM 1992, 1996a, 1997a) is projected to include approximately 1,300 new wells (9,985 acres of long-term disturbance) over a 20-year period (1990-2010). The level of development within the RSFO area required for the Continental Divide/Wamsutter II Project as identified in this EIS (see Table 2.1) includes a maximum of approximately 930 new well locations and approximately 2,600 acres of new long-term disturbance (31% of the project development total). Therefore, the proposed project is within the reasonably foreseeable estimates for future oil and gas development within the RSFO area.

Reasonably foreseeable development for oil and gas activity within the RFO area as described in the GDRA RMP (BLM 1987a) is projected to include approximately 1,440 new wells (16,092 acres of long-term disturbance) over a 20-year period (1986-2005). The level of development within the RFO area required for the Continental Divide/Wamsutter II Project as identified in this EIS (see Table 2.1) includes a maximum of approximately 2,070 new well locations (69% of the project development total). A check of well data in 1998 showed that 1,145 wells (including plugged and abandoned wells) have been drilled within the RFO area, since 1985 (i.e., 295 more wells could be drilled under the existing reasonably foreseeable development estimate for the RFO area). Therefore, the reasonably foreseeable development estimate of the number of future oil and gas wells within the RFO area would be exceeded by this project.

However, impact assessments and planning decisions within the RFO area (BLM 1987a, 1988b, 1990a) were based on the estimated disturbance acreage, not the number of wells. Since 1985, efficiencies within the oil and gas industry have resulted in reductions in the disturbance acreage required for oil and gas exploration and production. The RMP estimate of future long-term oil and gas disturbance within the RFO area was projected to be approximately 16,092 acres for 1,440 wells (approximately 11.2 acres/well); however, estimates based on the existing long-term oil and gas disturbance within the CD/WIIPA (7,600 acres for 845 wells; see Table 2.1), reveal that approximately 9.0 acres of long-term disturbance is present for each of the 845 wells. This 9.0 acres is a conservative estimate (overestimation) of long-term disturbance.

Using 9.0 acres of long-term disturbance per well, it is estimated that approximately 10,305 acres of long-term disturbance has resulted from the 1,145 wells developed within the RFO area since 1986. An additional 1,200 acres of long-term oil-and-gas-related disturbance (approximately 298 well locations) has been authorized or proposed within the RFO area for the Creston/Blue Gap, Mulligan Draw, Hay Reservoir, Sierra Madre, Dripping Rock, and South Baggs (proposed) projects. Therefore, approximately 4,587 acres (16,092 acres projected in the RMP less 10,305 acres estimated existing long-term disturbance and 1,200 acres authorized or proposed future disturbance) remain for long-term oil and gas development disturbance in the RFO area.

The Continental Divide/Wamsutter II Project is estimated to require approximately 5,727 acres of long-term disturbance in the RFO area (2,070 well locations at 2.77 acres per well). Therefore, long-term disturbance acreage estimates for the Continental Divide/Wamsutter II Project exceed the GDRA RMP/EIS reasonably foreseeable development estimates for future oil and gas development in the RFO area.

The GDRA RMP (BLM 1987a, 1988b, 1990a) projected a planning period of 20 years, and data used in RMP analyses for oil and gas development was compiled through 1985. Monitoring and tracking of well development since the completion of the RMP will continue. BLM initiation of a RFO area land use plan review and possible amendment will occur prior to reaching the reasonably foreseeable disturbance estimates made in the current RMP, and the BLM will not authorize oil and gas development actions (APDs, ROWs) that exceed current reasonably foreseeable disturbance estimates prior to the plan review and possible amendment. Based on the long-term disturbance acreage required per well for the Continental Divide/Wamsutter II Project (2.77 acres) approximately 1,655 wells could be authorized in the RFO area under the existing reasonably foreseeable disturbance acreage estimate (i.e., 1,655 wells = 4,587 acres of available long-term disturbance divided by 2.77 acres per well).

The 20-year planning period for the RFO area extends until approximately year 2005 and, if authorized, the Continental Divide/Wamsutter II Project is estimated to be less than 30% developed by this date (i.e., <621 well locations; <1,718 acres long-term disturbance within the RFO area).

The Proposed Action and alternatives would be compatible with the Carbon County Land Use Plan (Pedersen Planning Consultants 1997, 1998), the Carbon County Land Use Inventory (University of Wyoming [UW] 1991, the *Sweetwater County Land Use Plan* (THK Associates, Inc. [THK] 1977), and the *State of Wyoming Land Use Plan* (Wyoming State Land Use Commission [WSLUC] 1979). The Proposed Action and alternatives would also be in compliance with the BLM's *Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management* (BLM 1997b).

1.2.5 Oil and Gas Leasing

The right to explore for and produce federal oil and gas is granted via an oil and gas lease. Federal oil and gas leases are contracts between the mineral owner (federal government) and the lease holder (Operators). Federal leases grant the Operators the right to explore for and remove oil and gas subject to payment of rentals and royalties to the federal government. In issuing leases, the BLM reviews the availability decision made in the RMP and offers specific lands for lease.

All federal lands in the CD/WIIPA are either leased or available for leasing for oil and gas exploration and development. In the leasing process, the BLM has considerable authority to avoid and minimize potential environmental impacts by placing restrictive conditions on the lease. Regulations that govern BLM's oil and gas leasing program are contained in 43 C.F.R. 3000 and 3100.

A lease does not convey an unlimited right to explore or an unlimited right to develop oil or gas resources. Leases are subject to terms designed to minimize adverse impacts to other resources. Stipulations modify the rights the government grants to the lessee. The lease terms, conditions, and stipulations are known by potential lessees prior to any sale. The BLM has the authority to modify the siting and design of facilities, to control the rate of development and timing of activities, and to require other reasonable mitigation (BLM Form 3100-11 and 43 C.F.R. 3101.1-2).

Standard lease terms, which apply to all leases, require that the lessee conduct operations in a manner that minimizes adverse impacts to the land, air, water, cultural, biological, and visual elements of the environment, as well as other land uses or users (40 C.F.R. 1505.2[c] and 1508.20). Under standard lease terms, the BLM can require relocation of the proposed drilling operation by up to 200 meters (m), can prohibit new surface disturbing operations for up to 60 days in 1 lease year, and can specify interim and final reclamation measures (43 C.F.R. 3101.1-2). Federal environmental protection laws such as the *Clean Air Act*, *Clean Water Act*, *Endangered Species*

Act, and *Historic Preservation Act* apply to all lands and are included in the standard lease terms. If threatened or endangered (T&E) species, objects of historic, cultural, or scientific value, or substantial unanticipated environmental effects are encountered during construction, all work affecting the resource must stop and the land management agency must be notified.

Stipulations can also be attached to a lease when, there are resource values, uses, or user conflicts identified that cannot be managed or accommodated by the standard lease terms. A stipulation is a provision that modifies standard lease rights and is attached to and made part of the lease. Stipulations may be applied to all, or part, of the acreage in a lease, as necessary for resource protection. Stipulations may be necessary if the authority to control the activity on the lease does not already exist under laws, regulations, or orders.

Stipulations are categorized into four types based on the *Uniform Format for Oil and Gas Lease Stipulations* (BLM and U.S. Department of Agriculture, Forest Service [USFS] 1989).

- Controlled Surface Use is intended to be used when fluid mineral occupancy and use are generally allowed on all or portions of the lease year-round, but because of special resource concerns or values, lease activities must be strictly controlled and/or modified.

- Timing Limitations prohibit oil and gas exploration and development activities for specific time periods less than 1 year.

- No Surface Occupancy (NSO) is intended for use only when other stipulations are determined to be insufficient to adequately protect the public interest. NSOs preclude all surface disturbance within portions of the lease area.

- Special Administrative stipulations are used in situations where the other stipulation types do not adequately address concerns. Special administrative stipulations are usually one of a kind and are usually provided by another federal agency or organization (non-BLM).

The policy of the Wyoming BLM is to use the least restrictive stipulations that will achieve resource protection goals. Once this determination has been made, the appropriate stipulations will be attached to all leases on available lands with resource values, uses, or user conflicts that cannot be accommodated by less restrictive mitigation.

An Operator may request the BLM to waive (permanently remove), except (case-by-case basis), or modify (permanently change) a stipulation. Approval is subject to: 1) a change in the circumstances or relative resource values; 2) demonstration by the Operator that the project can be conducted without causing unacceptable impacts; and 3) evidence that less restrictive stipulations will protect the public interest.

On a case-by-case basis, the BLM may consider modifying or waiving a stipulation at the time the APD and surface use plan of operations are being reviewed and appropriate environmental documentation is being prepared. No requests to modify or waive lease stipulations have been received by the BLM in Wyoming during the last 10 years.

An exception to a lease term may or may not be considered a substantial modification. If the exception is consistent and in conformance with the management plans, the BLM Authorized Officer may authorize the exception. Substantial exceptions requested by the lessee are subject to public review during the APD process.

A request for exception must be initiated in writing by the Operator. This may be done concurrently with submission of an application (typical for situations involving lease stipulations) or subsequent to permit approval. When requested concurrently with an application, the exception from a stipulation is considered as part of the project proposal in the RMP and NEPA compliance review. For separate requests, the request is considered a unique action and is analyzed and documented individually for RMP and NEPA compliance.

Numerous requests for exceptions to seasonal wildlife stipulations are received. The unpredictability of weather, animal movement and condition, etc., preclude analysis of requests related to wildlife far in advance of the time periods in question. Analysis of requests include review of potential mitigation measures and alternatives (traffic restrictions, alternative scheduling, staged activity, etc.) and would be handled as specified in the Oil and Gas Memorandum of Understanding (MOU) between the BLM and Wyoming Game and Fish Department (WGFD) (BLM and WGFD 1995).

Land use activities may be authorized with additional mitigations resulting from NEPA analysis. These mitigations may include seasonal restrictions or distance restrictions for sensitive and crucial habitats and are imposed to provide protection of other important resources. Protective wildlife seasonal mitigations are developed consistent with statewide dates. For example, big game crucial winter ranges are protected from November 15 through April 30. This restriction is not intended to close an area to development every year but rather to protect big game if weather or other habitat needs dictate. The BLM will only grant exceptions to seasonal restrictions if the BLM wildlife biologist, in consultation with the WGFD, feels that granting an exception will not jeopardize the population being protected (BLM and WGFD 1995). Wildlife biologists use specific criteria when considering a request for an exception, and professional judgement plays a key part in the biologist's recommendation to the Field Manager (formerly the Area Manager) to grant or not grant exceptions.

Lease Notices are also issued to specific leases when a condition exists that may require unusual measures by the lessee and the BLM desires to give notice of such a condition. Any requirement contained in a Lease Notice must be fully supported in either law, regulation, standard lease terms, or an onshore oil and gas order.

1.2.6 Geophysical Exploration

Geophysical exploration (e.g., seismic reflection surveys) is often associated with oil and gas development. All geophysical operations on BLM-managed surface must be reviewed under NEPA and specifically authorized. An Operator files a "Notice of Intent (NOI) to Conduct Oil and Gas Geophysical Exploration Operations" with the Field Manager. The NOI includes a map showing the project location and all access routes and ancillary facilities, and an EA is prepared. A pre-work field conference may be conducted. The BLM then notifies the Operator of the practices and procedures which must be followed to conduct the exploration. Upon completion of the exploration, including any required rehabilitation, the Operator files a "Notice of Completion of Oil and Gas Geophysical Exploration Operations." The BLM then conducts a final inspection and notifies the Operator that the terms and conditions of the NOI have been met or that additional action is necessary.

1.2.7 Exploratory Drilling

The exploratory drilling phase presents the first opportunity for the BLM to make decisions regarding site-specific surface-disturbing activities on a lease. Lessees and their operators, contractors, and subcontractors are not permitted to commence any activity on a lease, other than surveying and staking well locations and/or inventorying cultural resources under a fieldwork authorization, without the prior approval of the BLM.

The Operator selects the location of a proposed drill site. The selection of the site is based on spacing requirements, subsurface geology, topography, economics, and other factors.

BLM's regulations for administering oil and gas drilling are contained in 43 C.F.R. 3160. The regulations require that before any well can be drilled, an APD must be submitted for review and approval. A complete APD consists of Form 3160-3 and an attached Drilling Plan, Surface Use Plan of Operations, evidence of bond coverage, designation of the operator, and other information required by applicable orders and notices.

During the review of the APD, an on-site inspection is conducted and detailed requirements and Conditions of Approval for the proposed well are developed. Conditions of Approval are applied if the environmental analysis conducted on the APD shows a need above and beyond the stipulations issued with the lease. If the Surface Use Plan of Operations is considered inadequate, the BLM may require modifications or impose conditions necessary for the protection of surface resources/uses and the environment. The decision to allow drilling of each well is then analyzed and documented in a NEPA analysis, typically an EA. Public notice of the decision may be provided, depending upon the interest and nature of the proposed project (BLM 1988a). The notice must indicate that the decision is subject to appeal. When final approval is given by the BLM, the Operator may commence construction and drilling operations. An approved APD is valid for 1 year. If construction and drilling do not begin within 1 year and the Operator requests an extension, the terms and stipulations of the permit must be reviewed for adequacy prior to renewing the APD.

1.2.8 Field Development

Following exploration and confirmation drilling, the Operators generally know the approximate extent of drilling and surface disturbance that will be required to fully develop the field. Field developments are typically analyzed at this stage in an EIS. The project-specific NEPA analysis addresses the cumulative impacts of full field development in relation to all past, present, and reasonably foreseeable future actions conducted in the area. This analysis is also used to develop mitigation measures which would reduce adverse environmental impacts and to identify reasonable alternatives to the proposal that would fulfill the project's purpose and need.

Spacing of oil and gas wells in Wyoming is regulated under WOGCC Rule 302. Factors considered in the establishment of spacing patterns include: the porosity, permeability, pressure, fluid composition, and depth of the reservoir and well production rates. Gas well densities generally range from one well per 80 acres to one well per 640 acres. If an Operator determines that a different spacing is necessary to achieve maximum efficient recovery, the WOGCC may grant exceptions to the spacing requirements. The procedures for obtaining approval to drill development wells are generally the same as those for exploration wells. This includes preparation of APDs and associated EAs for each proposed federal well.

Many fields go through several development stages. A field may be considered fully developed and produce until resources are depleted. Later, wells may be drilled to tap reserves in a deeper formation. Discovery of a new producing formation may then lead to additional drilling or existing wells may be drilled deeper. A new stage of development could lead to substantial changes in existing facilities including roads, produced water disposal sites, pipelines, etc. If these changes occur, further NEPA analysis takes place.

Oil and gas development on nonfederal mineral estate often precedes development of federal minerals. The delayed development of federal minerals can cause potential federal mineral drainage situations, and in areas with a checkerboard mineral ownership pattern (i.e., most of the CD/WIIPA), this situation can often occur.

1.2.9 Oil and Gas Production

While approval by the BLM and other relevant federal and state agencies is required before oil and gas can be produced, site-specific decisions generally are made during APD reviews. Production operations may be reviewed by the BLM at any time to determine if they are in conformance with existing RMPs and associated NEPA documents, and these reviews are conducted to ensure that the proposed project would not cause impacts beyond those already addressed in the RMP and/or field development EIS. If the decision is made to allow production of the gas reserves, several additional site-specific plans are prepared. All off-lease ancillary facilities (including roads, pipelines, water wells, injection wells, evaporation ponds, compressor stations, tank batteries, etc.) located on federal lands require approved ROWs or temporary use permits by the BLM. Additional on-lease/unit approval must also be obtained by filing of a Sundry Notice if any supplementary well operations are conducted (i.e., redrilling, deepening, casing repair, performing nonroutine fracturing jobs, recompleting in a different interval, performing water shut off, commingling production between intervals, or converting the well to an injection well).

The BLM's objective in overseeing this stage of development is to maximize recovery of oil and gas while minimizing waste and adverse effects on other resources. Numerous drilling and production reports are also required to be submitted to the BLM and/or the Minerals Management Service during this phase.

1.2.10 Plugging, Abandonment, and Restoration

The final phase of oil and gas activity is plugging, abandonment, and restoration. Plugging a well is conducted to prevent fluid migration between zones

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and to protect other downhole resources. This phase is initiated by the Operator by filing a "Notice of Intent to Abandon." Well abandonment operations may not be conducted until approval of this notice. Each well has unique characteristics that must be considered to correctly accomplish plugging; therefore, site-specific requirements are developed for each well.

Upon completion of approved plugging operations, the Operator is required to remove all surface facilities and restore the well location to its original grade and vegetative characteristics (according to the reclamation plan, as submitted and approved as part of the Surface Use Plan of Operations at the APD stage). Access road reclamation is also completed at this time if the road is not needed for other purposes. Upon completion of reclamation, the Operator files a "Final Abandonment Notice" which indicates the site is ready to be inspected by the BLM. If the location is adequately reclaimed, the well is removed from the Operator's bond.

1.3 AUTHORIZING ACTIONS

Although NEPA provides the regulatory framework to evaluate a proposed project, a number of other regulatory requirements are applicable. Conducting oil and gas activities on federal lands requires numerous authorizations which involve several federal, state, and local agencies. As general authority, the BLM manages the surface resources and maintains permitting authority for most surface-disturbing activities. BLM regulations governing operations associated with the exploration, development, and production of oil and gas deposits from leases issued or approved by the U.S. are contained in 43 C.F.R. 3160. The BLM has also issued eight onshore oil and gas orders to implement and supplement general regulations (43 C.F.R. 3164). The BLM further issues Notices to Lessees (NTLs) and Operators which implement onshore oil and gas orders and serve as instructions on specific items.

The WOGCC enforces extensive rules on various aspects of oil and gas operations. These include exploration, drilling, and production, among other activities. The Wyoming Department of Environmental Quality (WDEQ) has specific authority relating to air quality, hazardous waste, solid waste, and water quality. Table 1.1 presents the major federal, state, and local permits, approvals, and authorizing actions necessary for construction, operation, maintenance, and abandonment of the project.

1.4 PUBLIC PARTICIPATION AND ISSUES AND CONCERNS

1.4.1 Initial Involvement/Scoping

Public scoping to determine issues and concerns to be addressed in this EIS commenced on March 6, 1995. Due to a change in the extent of the project, public scoping was reinitiated on May 30, 1997. Scoping notices were mailed to 1,040 individuals, agencies, and groups (including government offices, elected officials, public land users and groups, lessees and operators, private landowners, newspapers, and radio and TV stations). The notices described the project and requested comments. Additionally, two public scoping meetings were held to provide further opportunity for public comment. Forty-seven comment letters and 15 telephone calls were received, and 18 comments were provided during the public meetings.

1.4.2 Issues and Concerns

Issues and concerns expressed during agency and public scoping include the following items grouped by general subject.

NEPA Compliance

- analysis of cumulative impacts
- analyze an alternative that limits development in environmentally sensitive areas
- analyze a maximum potential well density alternative
- analyze an alternative minimizing surface impacts
- analyze a true No Action Alternative
- analyze cumulative impacts from all developments within a 50-mi radius of the project boundary
- attempts to tier NEPA compliance to the GRRA RMP/DEIS is unacceptable and violates NEPA
- BLM should prepare programmatic EIS for southwest Wyoming
- clearly identify all data inadequacies in the EIS

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Table 1.1 Major Federal, State, and Local Permits, Approvals, and Authorizing Actions, Continental Divide/Wamsutter II Project, Sweetwater and Carbon Counties, Wyoming, 1999.[1]

Agency	Permit, Approval, or Action	Authority
Bureau of Land Management (BLM)	Permit to drill, deepen, or plug back on BLM-managed land (APD process)	*Mineral Leasing Act of 1920*, as amended (30 U.S.C. 181 et seq.); Requirements for Operating Rights Owners and Operators, as amended (43 C.F.R. 3162)
	Rights-of-way grants and temporary use permits for pipelines and central tank battery on BLM-managed land	*Mineral Leasing Act of 1920*, as amended (30 U.S.C. 185); Onshore Oil and Gas Unit Agreements: Unproven Areas, as amended (43 C.F.R. 3180)
	Right-of-way grants for access roads on BLM-managed land	*Federal Land Policy and Management Act* (43 U.S.C. 1761-1771); Right-of-Way, Principles and Procedures, as amended (43 C.F.R. 2800)
	Authorization for flaring and venting of natural gas on BLM-managed land	*Mineral Leasing Act of 1920*, as amended (30 U.S.C. 181 et seq.); Requirements for Operating Rights Owners and Operators, as amended (43 C.F.R. 3162)
	Plugging and abandonment of a well on BLM-managed land	*Mineral Leasing Act of 1920*, as amended (30 U.S.C. 181 et seq.); Requirements for Operating Rights Owners and Operators, as amended (43 C.F.R. 3162)
	Antiquities and cultural resource permits on BLM-managed land	*Antiquities Act of 1906*, as amended (16 U.S.C. 431-433); Archaeological Resources Protection Act of 1979, as amended (16 U.S.C. Sections 470aa-470ll); Preservation of American Antiquities, as amended (43 C.F.R. 3)
	Approval to dispose of produced water on BLM-managed land	*Mineral Leasing Act of 1920*, as amended (30 U.S.C. 181 et seq.); Special Provisions, as amended (43 C.F.R. 3164); Onshore Oil and Gas Order No. 7, as amended (58 Fed. Reg. 47,354)
Carbon and Sweetwater Counties	Mineral extraction permits	County Code
	Construction/use permits	County Code and Zoning Resolution
	Conditional use permits	County Code and Zoning Resolution
	Road use agreements/oversize trip permits	County Code
	County road crossing/access permits	County Code/Engineering Department
	H_2S contingency plan	County Health Department
	Small wastewater permits	County Health Department
	Hazardous material recordation and storage	County Code
	Zone changes	Zoning Resolution
	Filing fees	County Code
	Noxious weed control	County Code

Table 1.1 (Continued)

Agency	Permit, Approval, or Action	Authority
U.S. Army Corps of Engineers (COE)	Section 404 permits and coordination regarding placement of dredged or fill material in area waters and adjacent wetlands	Section 404 of the *Clean Water Act of 1972*, as amended (33 U.S.C. 1344); EPA-administered Permit Programs: The National Pollutant Discharge Elimination System (NPDES), as amended (40 C.F.R. 122); State Program Requirements (40 C.F.R. 123); Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Filled Material, as amended (40 C.F.R. 230)
U.S. Fish and Wildlife Service (USFWS)	Coordination, consultation and impact review on federally listed threatened and endangered (T&E) species	*Fish and Wildlife Coordination Act* (16 U.S.C. 661-666c); Section 7 of the *Endangered Species Act of 1973*, as amended (16 U.S.C. 1536); *Bald Eagle Protection Act* (16 U.S.C. 668-668dd)
	Migratory bird impact coordination	*Migratory Bird Treaty Act* (16 U.S.C. 704)
U.S. Environmental Protection Agency (EPA)	Spill Prevention Control and Countermeasure (SPCC) Plans	Oil Pollution Prevention, as amended (40 C.F.R. 112)
	Regulate hazardous waste treatment, storage, and/or disposal	*Resource Conservation and Recovery Act of 1976*, as amended (42 U.S.C. 6901)
U.S. Department of Energy (DOE)	Regulate interstate pipeline product transportation	Scattered sections of the U.S.C.
U.S. Department of Transportation (DOT)	Control pipeline maintenance and operation	Transportation of Natural and Other Gas by Pipeline; Annual Reports, Incident Reports, and Safety Related Condition Reports, as amended (49 C.F.R. 191); and Transportation of Natural and Other Gas by Pipeline: Minimum Safety Standards, as amended (49 C.F.R. 192)
Wyoming Department of Environmental Quality - Water Quality Division (WDEQ-WQD)	Permits to construct settling ponds and waste water systems, including ground water injection and disposal wells	*Wyoming Environmental Quality Act*, Article 3, Water Quality, as amended (W.S. 35-11-301 through 35-11-311)
	Regulate disposal of drilling fluids from abandoned reserve pits	*Wyoming Environmental Quality Act*, Article 3, Water Quality, as amended (W.S. 35-11-301 through 35-11-311)
	NPDES permits for discharging waste water and storm water runoff	WDEQ-WQD Rules and Regulations, Chapter 18; *Wyoming Environmental Quality Act*, Article 3, Water Quality, as amended (W.S. 35-11-301 through 35-11-311); Section 405 of the Federal *Water Pollution Control Act (Clean Water Act)* (codified at 33 U.S.C. 1345); EPA-administered Permit Programs: NPDES, as amended (40 C.F.R. 122); State Program Requirements (40 C.F.R. 123); EPA Water Program Procedures for Decision-making, as amended (40 C.F.R. 124)
	Administrative approval for discharge of hydrostatic test water	*Wyoming Environmental Quality Act*, Article 3, Water Quality, as amended (W.S. 35-11-301 through 35-11-311)
Wyoming Department of Environmental Quality - Air Quality Division (WDEQ-AQD)	Permits to construct and permits to operate	*Clean Air Act*, as amended (42 U.S.C. 7401 et seq.); *Wyoming Environmental Quality Act*, Article 2, Air Quality, as amended (W.S. 35-11-201 through 35-11-212)
Wyoming Department of Environmental Quality - Land Quality Division (WDEQ-LQD)	Mine permits, impoundments, and drill hole plugging on state lands	*Wyoming Environmental Quality Act*, Article 4, Land Quality, as amended (W.S. 35-11-401 through 35-11-437)

Table 1.1 (Continued)

Agency	Permit, Approval, or Action	Authority
Wyoming Department of Environmental Quality - Solid Waste Division (WDEQ-SWD)	Construction fill permits and industrial waste facility permits for solid waste disposal during construction and operations	*Wyoming Environmental Quality Act*, Article 5, Solid Waste Management, as amended (W.S. 35-11-501 through 35-11-520)
Wyoming Department of Transportation (WDOT)	Permits for oversize, overlength, and overweight loads	Chapters 17 and 20 of the Wyoming Highway Department Rules and Regulations
	Access permits to state highways	Chapter 13 of the Wyoming Highway Department Rules and Regulations
Wyoming Oil and Gas Conservation Commission (WOGCC)/Wyoming Board of Land Commissioners/Land and Farm Loan Office	Approval of oil and gas leases, ROWs for long-term or permanent off-lease/off-unit roads and pipelines, temporary use permits, and developments on state lands	Public Utilities, W.S. 37-1-101 et seq.
WOGCC	Permit to drill, deepen, or plug back (APD process)	WOGCC Regulations, Chapter 3, Operational and Drilling Rules, Section 2 Location of Wells
	Permit to use earthen pit (reserve pits)	WOGCC Regulations, Chapter 4, Environmental Rules, Including Underground Injection Control Program Rules for Enhanced Recovery and Disposal Projects, Section 1, Pollution and Surface Damage (Forms 14A and 14B)
	Authorization for flaring or venting of gas	WOGCC Regulations, Chapter 3, Operational and Drilling Rules, Section 45 Authorization for Flaring or Venting of Gas
	Permit for Class II underground injection wells	Underground Injection Control Program: Criteria and Standards, as amended (40 C.F.R. 146); State Underground Injection Control Programs, State-administered program - Class II Wells, as amended (40 C.F.R. 147.2551)
	Well plugging and abandonment	WOGCC Regulations, Chapter 3, Section 14, Reporting (Form 4); Section 15, Plugging of Wells, Stratigraphic Tests, Core, or Other Exploratory Holes (Form 4)
	Change in depletion plans	*Wyoming Oil and Gas Act*, as amended (W.S. 30-5-110)
Wyoming State Engineer's Office (WSEO)	Permits to appropriate ground water (use, storage, wells, dewatering)	W.S. 41-3-901 through 41-3-938, as amended (Form U.W. 5)
Wyoming State Historic Preservation Office (SHPO)	Cultural resource protection, programmatic agreements, consultation	Section 106 of *National Historic Preservation Act of 1966*, as amended(16 U.S.C. 470 et seq.) and Advisory Council Regulations on Protection of Historic and Cultural Properties, as amended (36 C.F.R. 800)

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[1] This list is intended to provide an overview of the key regulatory requirements that would govern project implementation. Additional approvals, permits, and authorizing actions may be necessary.

- concerns with the leasing process
- continue to provide information as the project progresses
- detailed analysis of alternatives
- discussion of No Action Alternative and its relation to lessee contractual rights
- do not conduct a piece-meal analysis
- do not base cumulative analysis solely on actual acreage of surface disturbance
- establish assessment protocol groups for wildlife, recreation, and water quality
- evaluate maximum field development
- identify cumulative impacts analysis areas for all affected resources
- if mitigation cannot be guaranteed, say so
- impacts to Operators by requiring NEPA analysis
- include South Baggs Project in cumulative effects analysis
- include existing wells in analysis
- involve affected state agencies prior to scoping and during project planning
- must require Operators to collect missing data
- object to use of industry-contracted consultants to prepare EIS

Development Activities

- bury power lines
- calculate existing road densities and habitat disturbance using recent aerial photography
- close existing roads to mitigate impacts caused by new roads
- define what optimal recovery means within the project area
- determine whether any improvements will be made to utility lines and roads in the Red Desert area
- encourage and facilitate voluntary measures to reduce impacts
- ensure that the integrity of the land is preserved
- establish a maximum level of development per section
- existing development practices work well to minimize impacts
- identify impacts caused by pipelines and other facilities
- identify problems associated with directional drilling
- if the economics are not currently profitable enough to properly mitigate impacts, delay development
- include maps of No Surface Occupancy and Limited Surface Occupancy lease areas in the cumulative impacts assessment
- increase use of directional drilling
- locate developments in areas with low potential for air, water, and visual pollution
- minimization of surface disturbance
- use automated pumping facilities
- use of best management practices during development and operations
- work camps require conditional use permits

Minerals Management

- desire not to change BLM's current oil and gas policies
- determine whether the BLM has met or exceeded its objectives for oil and gas development
- prevention of uncompensated federal mineral drainage from private lands
- protection of mineral resources
- unreasonable restrictions on construction of utility and pipeline facilities

Wildlife and Fisheries

- additional wildlife surveys necessary for exceptions to stipulations should (should not) be funded by Operators
- allow no construction within a 0.5-mi buffer of sage grouse leks
- allow no construction within a 2.0-mi buffer while sage grouse leks are active
- analysis of direct, indirect, and cumulative impacts to wildlife habitats and populations
- avoid power line and production facility construction within 0.75 mi of sage grouse leks
- baseline wildlife data collection and associated sampling plans and sample size estimation
- baseline wildlife surveys (raptors, sage grouse, T&E) should extend 2.0 mi outside the project boundary
- conduct extensive raptor nest searches on Delaney Rim and the Haystacks
- consider a disciplinary policy for employees convicted of poaching or harassing wildlife

- consider any increase in wildlife mortality as a significant impact
- cumulative impacts should address both displacement and habitat loss, as well as additional habitat fragmentation
- define effective mitigation and implementation procedures to compensate for habitat loss and loss of habitat effectiveness
- determine whether significance criteria established in previous EISs would be exceeded
- develop on- and off-site mitigation plans and for direct habitat losses, as well as for indirect impacts
- develop a wildlife monitoring plan with increased survey intensity relative to increased well densities
- displacement and stress of wildlife including big game species
- disruption of native wildlife habitat
- do not waive wildlife mitigation requirements
- habitat fragmentation from roads
- identification of mitigation measures to prevent lek abandonment (e.g., buffer expansions, extensions to seasonal avoidance periods, restrictions on vehicular travel, realignment of existing roads)
- impacts of new power lines, especially to increased sage grouse predation
- impacts of noise on sensitive wildlife, particularly strutting sage grouse
- impacts of roads and fences on big game, especially antelope
- impacts to candidate species and other sensitive species, including mountain plover and loggerhead shrike
- impacts to populations on private lands
- impacts to sensitive, priority, special status, and T&E plant and animal species including downstream fisheries
- implementation of standard wildlife stipulations
- incorporate new information on ferruginous hawk response to development and identify more effective mitigation measures (e.g., buffer expansions, extensions to seasonal avoidance periods, restrictions on vehicular travel, realignment of existing roads)
- incorporation of wildlife research projects to help determine potential impacts to wildlife
- loss of wildlife forage
- maintain a 0.75-mi buffer around active raptor nests during the breeding season
- minimize well densities in important wildlife areas
- mitigate wildlife impacts on private lands
- mitigation for long-term loss of crucial wildlife habitat should include shrub treatments, water developments (e.g., industrial water for wildlife outside winter ranges), fence modifications, adjustments in livestock use, and reclamation of abandoned surfaces
- mitigation of short-term loss of crucial wildlife habitat should include replacing browse species quickly
- mitigation should include avoiding breeding areas of candidate and sensitive species during the breeding season
- monitoring surveys should be conducted annually for raptors and sage grouse
- mortality to big game due to poaching and vehicle collisions
- must acquire and analyze all existing wildlife data
- pipeline development may improve winter wildlife habitat by removing decadent sagebrush
- power line construction should be in accordance with raptor-safe criteria established by the Avian Power Line Interaction Committee (APLIC)
- require Operators to prohibit guns and dogs from job sites
- raptor nests and sage grouse leks should be monitored annually
- reduce impacts to wildlife
- sage grouse and raptor protection
- thorough analysis of noise impacts to wildlife

Wild Horses

- impacts to wild horses

Vegetation

- avoid/minimize impacts to wetlands/special aquatic sites
- impacts to wetlands or waters of the U.S.
- noxious weed control
- protection of wetlands

Surface and Ground Water

- compliance with the *Clean Water Act*

- determine whether WDEQ-Water Quality Division (WQD) "water quality limited segments" would be affected and recommend approval of total maximum daily loads prior to project authorization
- ensure that potential water wells be turned over to appropriate landowners
- protection of aquatic habitats
- surface water and ground water quality and quantity protection

Socioeconomics

- adequacy of existing housing for immigrants
- annual reporting of projected employment requirements
- assess cumulative socioeconomic impacts to southwestern Wyoming
- case-by-case county review of oil and gas developments in close proximity to rural communities and population centers
- economic impacts on annual State of Wyoming revenues
- how many employees will be required, what percentage of employees will be local, and how do peak periods of employment coincide with other regional industrial expansions
- how many immigrants are anticipated to be retained in the area after project completion
- identify project initiation and completion dates and peak periods for drilling and employment
- impacts of development on surrounding communities
- increased EIS emphasis on beneficial socioeconomic impacts
- social, economic, and infrastructure effects to local communities from increased work forces and immigrants
- where employees will reside and how the increased housing demand will relate to the projected needs of other ongoing projects

Land Use

- adherence to Sweetwater County land use plan
- all wilderness areas should be protected
- concerns with existing fiber optic cable along railroad ROW
- consider state lands as private lands and land use decisions should compliment state management operations
- consult with the State Surface Leasing and Mineral Division during alternative development
- continue historic pattern of cooperation between landowners, mineral owners, and BLM
- honor all private property rights or declare a federal taking and make full payment
- landowner notification prior to development
- no development of private lands without landowner consent
- no development within power line ROWs
- reasonable access to public lands
- WSAs (Adobe Town, Alkaline Basin/East Sand Dunes, Red Lake, and Alkali Draw)

Livestock Grazing

- increased livestock forage availability on reclaimed areas
- loss of forage
- minimize disruption of livestock operations

Cultural Resources

- area contains Shoshone sacred sites, burials, camp sites, etc.
- cultural/historic resources including historic trails, and adherence to *National Historic Preservation Act* and Advisory Council regulations
- identify position on the protection and preservation of sacred and archaeological sites
- initiate consultation with Native Americans to identify significant traditional, cultural, and spiritual sites that require protection
- notification of interested parties prior to the disturbance of archaeological sites
- recognize the Shoshone Tribe and the Medicine Wheel Coalition as interested parties and inform affected tribes and the coalition regarding known traditional cultural properties in the area

Transportation

- analyze alternative travel corridors and road standards
- build roads to minimum standards
- concern over large committees for transportation planning and difficulties in committee problem-solving
- consider a "no net gain" policy for roads

- county involvement in mainline road development and maintenance
- establish limits for road development (how many roads are too many roads, how dense is too dense)
- form a task force to develop a coordinated transportation plan to address access issues (e.g., county permits, drainage, safety, Uniform Fire Code compliance, traffic demands, county access), construction plans (e.g., permits, construction use, zone changes), and maintenance specifications (roads, cattle guards, bridges, heavy equipment)
- implementation of Green River Basin Advisory Council (GRBAC) recommendations
- maximize use of existing road and pipeline corridors
- need for a transportation planning process that includes the state and counties
- road construction costs and area of disturbance are increased when curves are planned for new roads to reduce visual impacts
- road development and transportation management and impacts caused by road development
- road development guidelines should be consistent across BLM district boundaries
- use existing two-track roads to access locations
- use same ROW for roads, pipelines, and power lines

Air Quality

- potential air quality impacts and conformance with the *Clean Air Act*
- predict impacts to sensitive aquatic ecosystems and visibility within the Bridger, Fitzpatrick, Mount Zirkel, Popo Agie, Rawah, and Savage Run wilderness areas; Dinosaur National Monument; and the Wind River Roadless Area
- identify potential hazardous air pollutant risks
- cumulative impacts analyses should consider all existing, proposed, and reasonably foreseeable future emissions in the greater Green River Basin
- address installation of ambient air quality monitoring stations
- require permits and best available control technologies (BACT) on all air pollutant emission sources, including volatile organic compounds (VOC)
- specify potential mitigation measures
- describe the use of natural gas as an alternative fuel to improve air quality

Hazardous Materials

- hazardous material use, production, transport, storage, and disposal
- health and safety concerns associated with radioactive materials or radon derived from uranium-bearing coals and other uranium deposits in the area
- proper disposal of materials

Geology/Soils

- highly erodible and unstable soils and associated erosion
- protection of paleontological resources

Reclamation

- document the criteria for well plugging and ground water protection
- identify why all disturbed areas would not be reclaimed
- outline minimum reclamation standards
- reclaim surface disturbance as quickly as possible
- reclaim all roads
- reclaimed areas can be beneficial for livestock and wildlife
- reclaim 2 mi of road for every 1 mi constructed
- reclamation success
- suitable reclamation and reseeding of disturbed areas to return lands to original condition
- use native plant species including cool and warm season grasses, forbs, and shrubs

Recreation

- analyze impacts to recreation
- increased access will provide increased recreational opportunity
- mitigate recreational impacts by consolidating checkerboard lands or acquiring access easements

Visual Resources

- visual resource impacts
- visual resource sensitivity
- with reclamation, visual impacts are negligible for roads

Noise

- noise should not exceed 55 dBA at 500 ft from source
- noise impacts should be mitigated

Other General Concerns

- acquire small wastewater permits
- all practicable means should be employed to minimize adverse impacts
- analyze and mitigate impacts to adjacent private and state lands
- analyze impacts to the Chain Lakes area
- consider effects to scenic, historic, and other unique resources
- consider people's current dependence on natural resources as a way of life
- impacts on fragile desert range
- increased emphasis on positive impacts
- increased human activity
- less extensive development plans preferred
- link the EIS with the Southwest Regional Energy Development analysis
- preserve integrity of the land
- use of periodic aerial photography for impact monitoring
- work with operators to increase awareness of environmental concerns

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2.0 PROPOSED ACTION AND ALTERNATIVES

Chapter 2.0 describes the Proposed Action (full field development), two development alternatives with surface disturbance limitations (Alternative A--14.0-acre maximum surface disturbance per federally managed section in sensitive resource areas [SRAs] [see Section 2.2] and Alternative B--30.0-acre maximum surface disturbance per federally managed section in SRAs [see Section 2.3]), and the No Action Alternative (see Section 2.4). The project entails the development of natural gas resources in the CD/WIIPA beginning in 1999, subsequent to the release of the ROD and continuing for approximately 20 years. Well location and bottom hole densities (as defined by the WOGCC) would vary across the CD/WIIPA and would likely range from 640 acres/well to 80 acres/well (1 to 8 wells per section). As areas of the CD/WIIPA are developed and more is learned about the natural gas resources on the area, WOGCC-specified spacing orders for the area may change.

The types, locations, and acreage of existing surface disturbance in the CD/WIIPA are presented in Maps 2.1 and 2.2 and Table 2.1. Table 2.1 also illustrates the estimated level of disturbance under the Proposed Action and No Action Alternatives. Alternatives involving project-wide well location densities, the drilling and development of varying numbers of wells, the exclusion of development on all public lands in the CD/WIIPA, and developments on and adjacent to the Adobe Town WSA were considered but rejected for economic, environmental, and/or legal reasons (see Section 2.5).

2.1 THE PROPOSED ACTION - FULL FIELD DEVELOPMENT (3,000 WELLS/3,000 WELL LOCATIONS)

Definitive predictions on the total number of wells and the timing of drilling operations are not currently possible due to the lack of natural gas exploration in much of the CD/WIIPA; however, the BLM's Reservoir Management Group and the Operators have indicated that a maximum 3,000 wells at 3,000 well locations may be developed in the CD/WIIPA (an estimated 1,500 wells or well locations on federal lands and/or federal mineral estate). Operators anticipate that fewer wells or well locations would be necessary, and in the event fewer locations are developed, decreased impacts are expected.

Drilling and development would begin in 1999 (subsequent to the release of the ROD) within the CD/WIIPA and continue for approximately 20 years, with a life-of-project (LOP) of 30-50 years. Additional location development within the Greater Wamsutter Area II is necessary due to the impracticality and uneconomic nature of directional drilling within portions of the area (see Section 1.0). Various associated facilities (e.g., roads, pipelines, power lines, water wells, disposal wells, evaporation ponds, compressor stations, gas processing facility) would also be constructed throughout the CD/WIIPA.

The Proposed Action would result in a maximum of: 7,800 acres of new surface disturbance from well locations (including on-site gathering, measurement, and dehydration facilities); 1,500 mi (10,000 acres) of new roads or upgrades of existing roads, 1,500 mi (4,500 acres) of new pipeline; and approximately 100 acres of new surface disturbance from ancillary facilities (i.e., five compressor stations [20 acres], one gas processing plant [30 acres], 10 water evaporation ponds [34 acres], five disposal wells [35 acres], and 50 water wells [25 acres]) (Table 2.1). Total new short-term and LOP surface disturbance resulting from the Proposed Action would be 22,400 acres and 8,300 acres, respectively (approximately 2.1% and 0.8% of the CD/WIIPA, respectively). With the inclusion of existing disturbance necessary for the proposed project, total new and LOP surface disturbance would be 33,600 acres and 15,900 acres, respectively (approximately 3.2% and 1.5% of the CD/WIIPA, respectively). Total project-required new and LOP surface disturbance on federal lands and/or mineral estate in the CD/WIIPA is estimated to be approximately 50% of total CD/WIIPA surface disturbance or 16,800 acres and 7,950 acres, respectively. This estimate of the distribution of disturbance is based on the checkerboard landownership pattern in the area; the actual distribution may vary.

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Table 2.1 Types and Approximate Acreages of Existing and Proposed Surface Disturbance, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

		Proposed Development[2]		No Action[3]	
Disturbance Type	Existing[1]	New[4]	LOP[5]	New[4]	Long-term[5]
Well locations	2,800	7,800	2,400	2,200	700
Oil and gas roads	5,400	10,000	5,800	2,800	1,600
Pipelines[6]	2,500	4,500	0	1,300	0
Ancillary facilities[7]	500	100	100	100	100
Other developments[8]	7,200	0	0	0	0
Subtotal	18,400	22,400	8,300	6,400	2,400
Existing	N/A	11,200[9]	7,600[9]	18,400[10]	14,800[10]
Total	18,400	33,600	15,900	24,800	17,200

[1] Developed from 1994 aerial photography of the CD/WIIPA and BLM (1995a), and includes disturbance from all existing disturbed well locations, roads, pipelines, ancillary facilities, and other developments present in the CD/WIIPA, including approximately 720 authorized, active, or unreclaimed well locations (see Map 2.2), 1,800 mi of oil and gas field roads (see Map 2.1), 280 mi of unreclaimed pipelines with an average disturbance width of 75 ft, ancillary facilities including gravel pits, pumping stations, and staging areas, and other developments (e.g., state and federal highways, county roads, residential/urban areas, railroads).

[2] Is consistent with the Proposed Action and assumes surface disturbance from 3,000 new well locations, 1,500 mi of new/upgraded road (0.5 mi average per well, 55-ft ROW/initial disturbance width), 1,500 mi of new pipelines (0.5 mi average per well, 50-ft ROW, 25-ft disturbance width outside road ROW), new ancillary facilities, and existing project-required disturbances.

[3] Assumes disturbance from approximately 845 new well locations, 422 mi of new/upgraded road, 422 mi of new pipelines, new ancillary facilities, and all existing disturbances. The level of natural gas development expected to occur under the No Action Alternative is approximately the same as that of existing oil and gas developments on the area. In the absence of further development on the area, no new disturbance would occur (see footnote 10, Section 3.5, and Table 3.18).

[4] Assumes new disturbance of approximately 2.6 acres at well locations, the entire 55-ft ROW for roads, the 25 ft of pipeline ROWs outside of road ROWs, the entire acreage required for ancillary facilities, and all existing disturbance required for the proposed project (see footnote 9).

[5] Assumes adequate reclamation of 1.8 acres at each new well location, 23 ft of all new road ROWs, the entire 25 ft of new pipeline ROWs outside of road ROWs, and all existing pipeline disturbance; includes disturbance from new ancillary facilities and some existing disturbance from roads, pipelines, and ancillary facilities since they would likely be used for the proposed project (see footnote 9); LOP and long-term = 30-50 years.

[6] Assumes 25 ft of pipeline ROWs would be within road ROWs (see Section 2.6.7), and pipeline ROWs would be adequately reclaimed within the first few years following construction.

[7] Includes all proposed ancillary facility disturbance (e.g., water wells, disposal wells, evaporation ponds, gas processing plant).

[8] Includes all existing disturbance from other developments in the CD/WIIPA not required for the proposed project (e.g., federal, state, county, and unimproved roads/routes, railroads, cultivated areas, gravel pits, residential/urban areas).

[9] Includes all existing disturbance (18,400 acres) less other developments not required for the proposed project (7,200 acres), and it is assumed that all existing pipeline disturbance (2,500 acres) and approximately 1,100 acres of short-term well location disturbance would be adequately reclaimed for the LOP.

[10] Includes all existing disturbance in the CD/WIIPA, and assumes that all existing pipeline and short-term well location disturbance would be adequately reclaimed for the LOP.

2.2 ALTERNATIVE A - 14-ACRE MAXIMUM SURFACE DISTURBANCE PER FEDERALLY MANAGED SECTION IN SRAS

Surface disturbance throughout the entire CD/WIIPA resulting from Alternative A would be similar to that from the Proposed Action, except that long-term (LOP) surface disturbance and associated impacts would likely be reduced on federal lands in SRAs (Table 2.2). It is assumed that reductions in the level of LOP surface disturbance would result in reductions in overall disturbance (both direct and indirect) to most sensitive resources. Approximately 27% of the CD/WIIPA is within SRAs (Map 2.3), and under Alternative A, a maximum of 14 acres of ground surface disturbance (exclusive of existing disturbance present on the area prior to the release of the ROD) would be allowed at any one time within SRAs on any given federally managed section (surface and/or mineral estate). Development on private and state surface and/or mineral estate would not be restricted under this alternative. The 14-acre maximum surface disturbance criteria was developed by the BLM based on public, agency, and resource specialist concerns regarding potential impacts to sensitive resources from natural gas field developments.

As developments move from exploration to full field development, the potential for significant impacts to sensitive resources is increased. The 14-acre criteria would allow Operators to explore for natural gas throughout the entire CD/WIIPA, but would require notable changes in operational procedures for field developments within SRAs. Under this alternative, Operators would be able to explore their leases within SRAs (e.g., one well location per section) and to develop a limited number of additional locations (e.g., from one to three) depending upon the extent of new surface disturbance and associated reclamation status (see Table 2.2).

SRAs were defined during preparation of this EIS by the BLM Interdisciplinary Team (IDT) based on public and agency concerns identified during scoping and during past environmental analyses conducted in the region. SRAs include areas with stabilized sand dunes, raptor nesting concentration areas, crucial big game winter ranges, areas proximal to residential areas, Visual Resource Management (VRM) Class II areas, and areas with high densities of cultural resource sites. Stabilized dunes were included because of the difficulties encountered during their reclamation. Raptor nesting concentration areas and big game crucial winter ranges were included to provide further protection for these potentially affected species. Areas proximal to residences were included to provide residents further protection from impacts to air quality, noise, and visual resources, and VRM Class II areas were included due to their sensitivity to visual resource impacts. Areas with high densities of cultural resource sites were included to provide further protection for these resources.

Surface disturbance limitation requirements would apply to all future oil and gas exploration and development activities conducted on federal lands in SRAs. To accommodate surface disturbance limitation requirements, Operators may limit surface disturbance through:

- operational changes (e.g., multiple wells per pad using directional drilling; modified well location, road, pipeline, and/or ancillary facility design; use of surface pipelines; delaying construction/drilling operations until all unnecessary project-required federal surface disturbances are reclaimed);
- selection of alternative locations for ancillary facilities (e.g., outside SRAs or off federal surface); and/or
- reclamation of unnecessary existing surface disturbance on their lease (e.g., two-track roads).

The BLM in consultation with other appropriate individuals, agencies, and land user groups (e.g., permittees, WGFD, U.S. Fish and Wildlife Service [USFWS]) may modify surface disturbance limitation requirements if the Operators can show that alternative operational procedures would provide greater protection for sensitive resources than would limiting surface disturbance. For example, the use of pipeline collection/distribution systems for condensate, drilling water, and/or produced water, which would temporarily increase overall ground surface disturbance, may in some instances be preferable since their use could result in a decrease in the level of human activity along access roads and at well locations, thereby reducing indirect habitat loss. In addition, remote sensing devices could be installed at well locations to further reduce human activity levels.

Implementation of Alternative A (and Alternative B, see Section 2.3) would involve an initial quantification

Table 2.2 Acreage and Percent Disturbance per Section (640 Acres) in Sensitive Resource Areas Under the Proposed Action and Alternatives A and B, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Development Level and Well Location Density	Proposed Action[1]				Alternative A[2]				Alternative B[3]			
	New		LOP		New		LOP		New		LOP	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Exploration[4] (1 well location/640 acres)	9.9	1.5	3.7	0.6	9.9	1.5	3.7	0.6	9.9	1.5	3.7	0.6
Initial Field Development[5] (1 well location/320 acres)	19.7	3.1	7.4	1.2	14.0	2.2	7.4	1.2	19.7	3.1	7.4	1.2
Full Field Development[6] (1 well location/160 acres)	30.0	4.7	11.0	1.7	14.0	2.2	11.0	1.7	30.0	4.7	11.0	1.7
Maximum Development[7] (1 well location/80 acres)	59.6	9.3	21.9	3.4	14.0	2.2	14.0	2.2	30.0	4.7	21.9	3.4

[1] Allows for federal surface development as specified in the Proposed Action.

[2] Limits development on federal surface to 14.0 acres of new disturbance per section at any one time in SRAs. Under Alternative A, total new surface area disturbed throughout the CD/WIIPA would likely be similar to that of the Proposed Action (see Table 2.1). Additionally, there may be an increase in non-BLM surface disturbance under this alternative.

[3] Limits development on federal surface to 30.0 acres of new disturbance per section at any one time in SRAs. Under Alternative B, total new surface area disturbed throughout the CD/WIIPA would likely be similar to that of the Proposed Action (see Table 2.1). Additionally, there may be an increase in non-BLM surface disturbance under this alternative.

[4] Includes one location, 0.75 mi of road, 0.75 mi of pipeline, and no ancillary facilities (water wells, disposal wells, or gas processing facilities).

[5] Includes two locations, 1.5 mi of road, 1.5 mi of pipeline, and no ancillary facilities; additional acreage may be required for ancillary facilities.

[6] Includes four locations, 2.0 mi of road, 2.0 mi of pipeline, and no ancillary facilities; additional acreage may be required for ancillary facilities.

[7] Includes eight locations, 4.0 mi of road, 4.0 mi of pipeline, and no ancillary facilities; additional acreage may be required for ancillary facilities.

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of the acreage of existing disturbance on federal sections within SRAs in areas proposed for development. This action initially would be completed by BLM personnel using existing information contained in APDs, ROW applications, and other authorizing documents. For the purpose of Alternative A (and Alternative B, see Section 2.3), reclamation generally would be considered adequate when interim success criteria have been achieved (see Appendix A, Section A-6.3.2); however, alternate success criteria may be used in some SRAs (e.g., successful shrub establishment may be required on crucial winter ranges). To verify the reclamation status associated with existing disturbances (i.e., achievement of success standards), some field investigations may be necessary. Further, where federal sections are only partially contained within SRAs, new disturbance within these areas would be prorated based on the proportion of the federal section contained in the SRA. Concurrent with new development, a system/database for tallying new disturbance less reclaimed areas would be developed. The BLM may require Operators to provide assistance with the quantification of surface disturbance on their leases in SRAs. To protect federal natural gas reserves from drainage within SRAs, these reserves may be developed regardless of reclamation status.

Total new area-wide short-term surface disturbance for this alternative could be the same as for the Proposed Action. However, total maximum long-term (LOP) disturbance on federally managed sections in SRAs would be reduced (Table 2.2), since newly disturbed areas would be reclaimed prior to the initiation of further surface-disturbing activities. Operators may elect to concentrate initial exploration and development on non-BLM lands or outside SRAs to avoid increased protection and mitigation requirements (i.e., increased development costs); therefore, some increase in the extent of surface disturbance on private or state lands within SRAs and on federally managed lands outside of SRAs could occur under this alternative.

2.3 ALTERNATIVE B - 30-ACRE MAXIMUM SURFACE DISTURBANCE PER FEDERALLY MANAGED SECTION IN SRAS

Area-wide surface disturbance resulting from Alternative B would be similar to that for the Proposed Action and Alternative A, except that surface disturbance and associated impacts would likely be increased on federal lands in SRAs from that occurring under Alternative A and reduced from that occurring under the Proposed Action (see Table 2.2). Maximum surface disturbance within SRAs (exclusive of existing disturbance present on the area prior to the release of the ROD for this project) would be limited to 30 acres per federal section at any one time. The 30-acre maximum surface disturbance limitation was developed via the same means as that described for Alternative A and allows Operators to develop natural gas resources at a level intermediate between Alternative A and the Proposed Action in SRAs. Under this alternative, Operators would be able to explore and conduct limited development of their leases within SRAs (e.g., from two to eight locations per section) depending upon the extent of new surface disturbance and associated reclamation status (see Table 2.2). To protect federal natural gas reserves within SRAs from drainage, these reserves may be developed regardless of reclamation status.

Total new short- and long-term surface disturbance throughout the CD/WIIPA under this alternative could be the same as that for the Proposed Action; however, there would likely be reductions in the level of long-term surface disturbance on federally managed lands in SRAs. Operators may elect to concentrate initial exploration and development on non-BLM lands or outside SRAs to avoid increased protection and mitigation requirements (i.e., increased development costs); therefore, some increase in the extent of surface disturbance on private or state lands within SRAs and on federally managed lands outside of SRAs could occur under this alternative.

2.4 NO ACTION

A No Action Alternative must be considered in all NEPA documents. Under the No Action Alternative, the BLM would deny the current proposal for natural gas development on federal lands in the CD/WIIPA as currently proposed by the Operators as specified in the Proposed Action. Denial of the current development proposal is not, however, a denial of all natural gas development in the area. Under the No Action Alternative, it is assumed that development of lands in the CD/WIIPA likely would occur at levels similar to those which have occurred on the area in the past (Table 2.1) and would occur as authorized by existing management directives contained in RMPs. The acreage of existing disturbance in the area is provided in Table 2.1, "Existing Disturbance" column, and in Section 3.5, and this information serves as a description of the baseline condition on the area, to which comparisons among project development alternatives can be made. Site-specific NEPA analyses would be conducted for all development activities on public lands or mineral estate; however, the planning measures identified for the Proposed Action and Alternatives A and B (e.g., Reclamation Plan [see Appendix A], Transportation Plan [see Appendix B], and Wildlife Protection Plan [see Appendix D]) would not be implemented.

For the purposes of this analysis, the No Action Alternative assumes that lands in the CD/WIIPA would be developed for natural gas production at approximately the same rate as has occurred previously (i.e., continuation of present management practices). This assumption is highly speculative since all federal lands within the CD/WIIPA have been leased for oil and gas production or are available for lease, the area is rated as suitable for gas production in the GRRA and GDRA RMPs, and accelerated development of the area has been proposed. Nonetheless, this assumption will allow a comparison of the economic and environmental consequences of the proposed development versus that of current development (i.e., no programmatic change). The selection of the No Action Alternative in this EIS would not preclude natural gas development in the area.

Under the No Action Alternative and for the purpose of this analysis, an estimated 845 well locations would be built, 422 mi of road would be constructed or upgraded, 422 mi of pipeline would be laid, and 100 acres of new surface disturbance would be required for ancillary facilities, resulting in a maximum of 6,400 acres of new surface disturbance and 2,400 acres of long-term surface disturbance (see Table 2.1). However, as specified below, development of the CD/WIIPA could exceed these levels. With the inclusion of all existing surface disturbances on the CD/WIIPA, total new and long-term surface disturbance under the No Action Alternative would be 24,800 acres and 17,200 acres, respectively, and approximately 50% of this disturbance likely would be on federally managed lands.

Since over half of the CD/WIIPA is not federally owned and the BLM would not necessarily deny access to these lands, it is possible that these lands could be developed as specified under the Proposed Action (i.e., 1,500 well locations with associated roads, pipelines, and ancillary facilities on private and state lands; approximately 11,200 acres of new disturbance, and 4,150 acres of new LOP disturbance). Further, limiting development of federal natural gas resources in the CD/WIIPA could result in drainage of federal gas reserves, which would not be in the public's best interest due to loss of royalties. Therefore, if it is determined that minerals owned by the U.S. are being drained by wells drilled on adjacent lands, the BLM would direct the lessee to drill and produce all wells necessary to protect the leased lands from drainage pursuant to 43 C.F.R. 3100.2 (see Section 1.2.2). In the event of private and state land development, and to avoid drainage of federal reserves, the BLM would authorize well development on federal lands (estimated at 144 wells) under this No Action Alternative.

NEPA requires the disclosure of potential conflicts with local and federal laws and alternatives that would be outside the lead agency's legal jurisdiction. The denial of the right to develop a valid lease could violate the lessees' contractual rights and result in the loss of federal royalties. An oil and gas lease grants the lessee the "right and privilege to drill from, mine, extract, remove, and dispose of all oil and gas deposits" in the leased lands, subject to the terms and conditions incorporated in the lease (BLM Form 3100-11). Because the Secretary of the Interior has the authority and responsibility to protect the environment within federal oil and gas leases, restrictions are imposed on the lease terms. On lands leased without a NSO stipulation, the BLM cannot deny an APD but can impose mitigation measures upon the lessee if unnecessary or undue environmental degradation would occur. In the absence of a NSO stipulation covering the entire lease, restrictions based on oil and gas lease operations must be "reasonable." They cannot directly or indirectly prohibit, altogether, the development of the lease. Although a given APD can be denied, the right to drill and develop somewhere on the leasehold cannot be denied by the BLM. To deny all activity would constitute a breach of contract of an Operator's rights to conduct development activities on the leased lands. Authority for complete denial can be granted only by Congress (which can order the leases forfeited subject to compensation). The BLM, therefore, can only suspend the lease pursuant to Section 39 of the *Mineral Leasing Act* pending consultation with the Congress for a grant of authority to preclude drilling and provide compensation to the lessee.

Most leases in the CD/WIIPA contain various stipulations addressing surface disturbance, steep slopes, wildlife, and other matters of concern. These stipulations would allow the BLM to preclude development in certain areas (e.g., where slopes exceed 25%) or at certain times of the year (e.g., to protect big game crucial winter habitat) if operations cannot be acceptably mitigated. However, there is no stipulation, such as a NSO, that would allow the BLM to preclude drilling operations everywhere on a lease at all times of the year. If any one of the stipulations cannot be acceptably implemented and impacts mitigated, than an exception would not be granted. A decision, therefore, of no action, as authorized by the leases, would only be considered, given one of the following conditions.

- If there were no acceptable means of mitigating significant adverse impacts to stipulated surface resource values, this would trigger denial of the APD and require consideration and analysis of another alternative(s). Effectively, exception(s) to one or more of the lease stipulations would not be approved.

- If the USFWS concluded that the Proposed Action and alternatives would likely jeopardize the continued existence of T&E plant and animal species, then the APD and lease development may be denied in whole or in part.

This EIS will help to determine whether the proposed project meets any of these conditions.

2.5 ALTERNATIVES CONSIDERED BUT REJECTED

CD/WIIPA-wide well densities/spacing patterns were examined during initial project design, however, known characteristics of the gas reservoirs on and adjacent to the CD/WIIPA indicate that area-wide spacing patterns are not practical and could result in unnecessary and undue surface disturbance and/or the potential drainage of federal reserves. Therefore, this alternative was rejected.

Alternatives involving fewer wells and associated facilities on all CD/WIIPA "lands" were also considered. These alternatives were rejected because the total extent of drilling and development necessary to recover existing natural gas resources on the CD/WIIPA is presently unknown. By limiting the number of wells in the area, these alternatives could inadvertently lead to drainage of the federal mineral estate and/or the necessity for future field-level NEPA analyses. Additionally, the BLM has limited authority over access to and development of private lands and nonfederal minerals; therefore, alternatives guiding development on these lands were considered unreasonable (see Section 1.0 and below).

An alternative addressing increased surface disturbance at each well location (4.5 acres of new surface disturbance per location and 1.2 acres of LOP surface disturbance per location) was initially considered. However, increased Operator efficiencies regarding drill site and production facility layouts have resulted in substantially reduced surface area requirements for drilling and production operations (i.e., 2.6 acres of new surface disturbance per location and 0.8 acres of LOP disturbance per location). Therefore, this alternative was rejected.

A phased development alternative (e.g., limiting well numbers at any one point in time on specific areas) was considered for analysis, but was rejected since the Proposed Action as described involves the incremental development of fields within the CD/WIIPA. Furthermore, the BLM lacks the authority to prohibit/substantially delay lease development once a lessee decides to develop its lease, and many areas on the CD/WIIPA have more than one lease per section. Additionally, it is anticipated that many wells on the area will be shut-in or abandoned prior to the completion of drilling on the CD/WIIPA, and the BLM cannot control private land development.

Various no development alternatives (i.e., the denial of APD and/or ROW applications on all CD/WIIPA lands) were also considered. These alternatives were rejected for the following reasons.

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- More than half of the CD/WIIPA is not federally owned and is managed by either the State of Wyoming or private owners, and development of these areas would occur regardless of any decision to deny development on federal land.

- The BLM cannot deny access to private holdings across federal lands. The BLM's policy concerning access to oil and gas reserves on nonfederal lands is contained in BLM Manual 2800.06D, release 2-224 (May 15, 1985), which directs the BLM to allow access to nonfederally owned land surrounded by public land managed under FLPMA as necessary to secure to the owner the reasonable use and enjoyment thereof. Ingress and egress need not necessarily require the highest degree of access, but rather a degree of access commensurate with the reasonable use and enjoyment of the land. The access necessary for the reasonable use and enjoyment of the nonfederal land cannot be denied, so long as the landowner complies with BLM rules and regulations on federal surface.

- The denial of all development on federal land could lead to the drainage of federal oil and gas reserves from wells on adjacent state and private surface (see Sections 1.2.2 and 2.4). A drainage stipulation designed to protect the federal mineral estate is included in the lease-term contractual agreements for all leased lands in the CD/WIIPA, and since private land developments are anticipated, some well development on BLM lands would occur.

- The denial of the right to develop a valid lease could violate the lessees' contractual rights and result in the loss of federal royalties. An oil and gas lease grants the lessee the "right and privilege to drill from, mine, extract, remove, and dispose of all oil and gas deposits" in the leased lands, subject to the terms and conditions incorporated in the lease. The BLM cannot directly or indirectly prohibit, altogether, the development of the lease. To deny all activity would constitute a breach of contract of the Operator's rights to conduct development activities on the leased lands. Authority for complete denial can be granted only by Congress (see Section 2.4).

Another alternative considered but rejected involved drainage drilling only. This alternative would have allowed drilling for federal minerals on federal leases only in areas being drained by offset nonfederal wells and would have greatly limited the number of wells drilled on federal minerals. In order to estimate the number of wells that might be drilled under this alternative, the following assumptions were made.

1. There would be 1,200 wells drilled on nonfederal minerals on a pattern of four wells per section, and 300 additional wells would be drilled as infill wells to produce a pattern of one well per 80 acres.
2. Wells drilled to increase well density from one well per 160 acres to one well per 80 acres would be drilled near the center of the sections, or within 200 ft of section lines.
3. The 90 gas wells (within or near the CD/WIIPA) analyzed by the Wyoming BLM Reservoir Management Group as part of drainage investigations are representative of all wells drilled to the Almond Formation in the project area. The analyses indicate that about 12% of the wells would have drainage radii larger than 0.25 mi. Wells drilled on nonfederal minerals and with a drainage radius larger than 0.25 mi would cause drainage of federal oil and gas and would cause a federal protective well to be drilled.

Based on these assumptions, there would be about 144 drainage protection wells drilled. However, this alternative was rejected for the legal reasons listed in the above bullets.

An alternative focusing on only federal land developments on the CD/WIIPA was also considered. The alternative was rejected because it would inadequately portray anticipated development on non-BLM lands in the CD/WIIPA. Development on private lands was considered under all alternatives analyzed (i.e., Proposed Action, Alternatives A and B, and No Action) to facilitate appropriate impact analyses.

The BLM also considered and rejected an alternative mandating the use of directional drilling, since all alternatives considered in this EIS may use directional drilling to access natural gas reserves beneath areas with sensitive surface resources. Further, due to the geology of the principle gas-bearing zone beneath the CD/WIIPA--the main Almond Sandstone Formation (see Section 3.1.4.1)--directional drilling may be technically and/or economically infeasible.

One additional alternative involving the development of lands within the Adobe Town WSA was considered. This alternative was rejected because the BLM will not allow surface disturbance to occur in WSAs.

2.6 PROJECT-WIDE DEVELOPMENT SPECIFICATIONS

The following project-wide development specifications apply to the Proposed Action and Alternatives A and B, unless otherwise specified; however, under the No Action Alternative, Operators and the BLM would not implement the planning and environmental protection measures identified in the Reclamation Plan (see Appendix A), Transportation Plan (TP) (see Appendix B), Transportation Planning Technical Support Document (TPTSD) (BLM 1999a), and Wildlife Protection Plan (see Appendix D) for this project. Therefore, the BLM believes that the Proposed Action and Alternatives A and B provide for improved regional planning and associated protection of sensitive resources over that of the No Action Alternative. Under all alternatives (including No Action), all lease terms, RMP mandates, and federal, state, and local laws, rules, and regulations would be adhered to.

Design, construction, operation, and reclamation practices may be modified by the Operators and/or the BLM as more site-specific economic, engineering, and environmental information becomes available. Site-specific development plans, including NEPA-mandated environmental analyses on all APDs, ROW applications, and Sundry Notices, would be prepared for each proposed well, road, pipeline, or ancillary facility constructed on federal land. Pursuant to Onshore Oil and Gas Order Nos. 1 and 2, each proposed well on federal land would require BLM approval of an APD prior to any surface disturbance. Each APD would include site-specific information regarding all facets of well development, including mitigation measures required to minimize adverse environmental impacts. Roads, pipelines, and ancillary facilities on BLM lands constructed in association with this project would require BLM ROW authorizations and/or Sundry Notices which could include additional mitigation to further minimize environmental impacts. Wells proposed on private and state lands would require approval by the WOGCC, and roads, pipelines, and/or ancillary facilities on these lands would require private landowner or state approval prior to construction.

Whereas project components presented in this EIS may undergo revision during agency reviews of individual APDs and ROW applications, these revisions would not substantially alter acreage requirements or general reclamation practices and would therefore be consistent with the environmental analysis presented in this EIS. Regardless, more detailed site-specific analysis would be required prior to development activities, and any changes would be addressed in subsequent analyses.

Construction, operation, and reclamation of well locations, access roads, pipelines, and all other surface-disturbing activities would comply with BLM mitigation guidelines and best management practices as presented in Section 2.6.13 and the Reclamation Plan for this project (Appendix A). Road construction would adhere to specifications in the BLM Roads Standards Manual, Section 9113 (BLM 1985, 1991a) and the TP for this project (Appendix B).

Operators would follow the procedures outlined below to gain BLM approval for proposed activities on federal lands within the CD/WIIPA. Permitting procedures on State of Wyoming and private lands would adhere to WOGCC rules and regulations (WOGCC 1998) and be subject to individual landowner preferences for development, operation, and reclamation practices. This EIS provides specific detail of developments on federally managed lands (surface and mineral). Developments on private and state lands are also assessed; however, since the BLM has limited authority to regulate activities on these lands, procedural modifications, (including alternate construction, operation, mitigation, and reclamation) could occur.

2.6.1 Preconstruction Planning and Site Layout

Prior to the start of construction activities, Operators would submit a Notice of Staking (NOS)/APD/Sundry Notice/ROW Application to the BLM with a map showing the specific location of the proposed activity (e.g., specific well location, road or pipeline route, or other facility site), as well as site-specific construction plans. Proposed development sites would be staked by the applicant and inspected by the BLM to ensure consistency with the application. An EA would be prepared to ensure all site-specific resources are evaluated and proposed operations comply with RMP and EIS decisions. Applications would be revised as necessary per negotiations with the BLM. The BLM would either deny or approve specific proposals and attach terms and conditions of approval to the permit. Upon receipt of BLM approval, the applicant could commence with proposed activities.

2.6.2 Road Construction and Use

2.6.2.1 Road Construction/Maintenance

Access to the CD/WIIPA would be from I-80, Wyoming Highway 789, Sweetwater County Roads 4-23 and 4-19, and other existing and newly constructed or upgraded roads in the CD/WIIPA (see Map 2.1). To access new well locations and facility sites, new roads would be constructed and existing roads may be improved. Site-specific analyses would be conducted on new and improved roads, and proper authorizations (i.e., ROW permits, APDs) would be obtained prior to construction. Road authorization, use, and maintenance responsibilities would be coordinated with area users, and roads on federal lands would be constructed following guidelines in the BLM road standards manual, Section 9113 (BLM 1985, 1991a). Roads would be built and maintained to provide year-round access.

The exact location of proposed roads within the CD/WIIPA is not known; however, specific access road construction would be in accordance with the BLM-approved TP (Appendix B) and the associated TPTSD for this project (BLM 1999a). New roads would be located to minimize disturbance, utilize existing disturbed areas (e.g., existing roads and pipeline corridors), avoid sensitive resources (e.g., raptor nests, cultural resource sites), and maximize transportation efficiency. Since much of the CD/WIIPA presently has only limited access by vehicles, it is estimated that 0.5-1.5 mi of new or upgraded road would be needed to access each well location or facilities site. Approximately 1.5 mi of new or upgraded road would be required for each well location or facilities site during exploration and initial development; however, in developed areas and as field development proceeds in other areas, it is estimated that an average of 0.5 mi or less of road would be required for each location. The estimated acreage of disturbance for roads for this project is presented in Table 2.1.

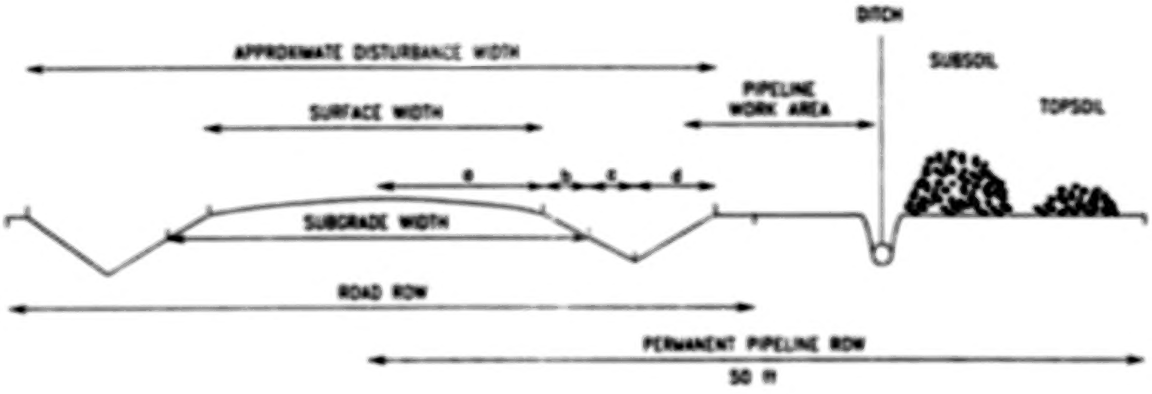
Figure 2.1 illustrates a typical road cross section with a parallel pipeline ROW. Surface disturbance would be contained within approved ROWs and would average 52 ft for collector roads (60-ft ROW), 48 ft for local roads (55-ft ROW), and 42 ft for resource roads (50-ft ROW). Disturbance width may increase in areas of rugged topography due to the necessity for cuts and fills. Since the exact location and length of collector, local, and resource roads cannot currently be determined, all roads are considered local roads for the purpose of this analysis, and since roads and pipelines would run parallel where practical, the entire road ROW is assumed to be disturbed at some time during project construction (i.e., 55-ft ROW with 6.7 acres of new surface disturbance per road mile). Pipeline disturbance is further described in Section 2.6.7.

Road classification is the process of grouping roads having like characteristics into distinct categories and, for the CD/WIIPA, defines the administrative and jurisdictional characteristics of each road classification. This classification will help identify road types and jurisdictional responsibilities by defining public roads, administered by the state and county agencies, and management roads, administered and controlled by the private and public land managers.

The following functional classifications are based on BLM Manual Section 9113 (BLM 1985) and Federal Highway Administration classifications (U.S. Department of Transportation [DOT] Federal Highway Administration 1992).

Arterial (Public Roads). Arterial roads serve large areas and are to be considered public roads. Arterial roads within the CD/WIIPA include Wyoming state

(NOT TO SCALE)



	MINIMUM SUBGRADE WIDTH (ft)	MINIMUM SURFACED TRAVELWAY WIDTH (ft)	a (ft)	b (ft)	c (ft)	d (ft)	APPROXIMATE DISTURBANCE WIDTH (ft)	ROW WIDTH (ft)	DESIGN SPEED (mph)
RESOURCE ROAD	16	14	7	2	4	8	42	50	15–30
LOCAL ROAD	24	20	10	2	4	8	48	55	20–50
COLLECTOR ROAD	28	24	12	2	4	8	52	60	30–50
ARTERIAL ROAD	SPECIFICATIONS WOULD BE AS REQUIRED BY STATE AND/OR COUNTY OFFICES								

DIAGRAM OF TYPICAL TURNOUTS ON RESOURCE ROADS

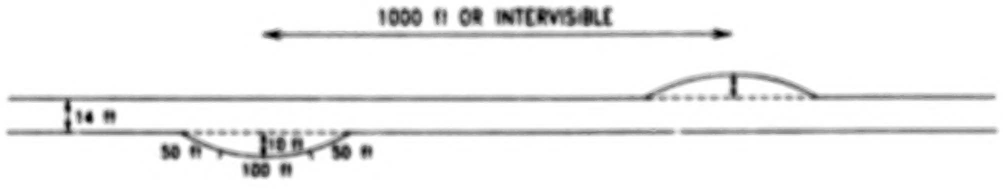


Figure 2.1 **Typical Parallel Road/Pipeline Cross Section with Width Specifications for the Proposed Road Types, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.**

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highways and Sweetwater and Carbon County roads. These roads are heavily traveled routes connecting developed areas of the CD/WIIPA to I-80, railroad crossings, industrial developments, services, and residential areas. These roads can be considered all-weather roads, and use of these roads is controlled by the Wyoming Department of Transportation (WDOT) or the respective county commissioners.

Arterial roads would be double-lane roads with shoulders and would be designed and constructed according to applicable state or county standards.

Collector (Management Roads). Collector roads serve smaller areas than arterial roads and may be divided into major and minor categories. The collectors channel moderate to heavy traffic to and from the arterial system. Major and minor collector roads within the CD/WIIPA are defined as follows.

- Major Collector. A developed road with recorded easements that provides public and industry access to the CD/WIIPA would be classified as a major collector road. Commonly, major collector roads would be BLM roads that are not a permanent part of the BLM road system, but are managed by BLM. A county road would be classified as a major collector if it supports only occasional use.

- Minor Collector. Developed roads with authorized ROWs issued by private landowners, BLM, or other land managers are classified as minor collector roads. These roads may include public-use rights, but use of these roads is at the discretion of the landowners and agencies. Portions of minor collector roads may have specific enforceable access restrictions.

Collector road maintenance objectives include the maintenance and improvement of drainage, road surfacing, and road grading to a smooth compact surface.

Collector roads would be double-lane roads and would be 24 ft wide after surfacing, with 4:1 ditches a minimum of 1 ft deep. These roads would have a gravel surface designed to support highway loads and provide a smooth compact road surface (without washboarding). Dust control may be required to retain the fines in the gravel. Collector roads would be designed for a minimum travel speed of 35 miles per hour (mph).

Local (Management Roads). Local roads normally serve smaller areas than collector roads, channeling light to moderate traffic to a collector or arterial system. Local roads may support very heavy off-highway loads. Authorization for use of local roads is at the discretion of the landowner or agencies. Local roads within the CD/WIIPA would serve specific groups of wells, services, or support facilities, and these roads may become a permanent part of a larger road system. Maintenance objectives would include maintaining drainage, surfacing selected segments, or road surface grading.

Local roads would be either double lane (20-24 ft wide after surfacing) or single lane (14-16 ft wide after surfacing) with turnouts and would have 4:1 ditches a minimum of 1 ft deep. Gravel surfaces would be designed to support heavy loads in excess of standard highway loads. Depending on the length of the road, smoothness of the surface may be less important than the ability of the surface to support heavy loads. Local roads would be designed for speeds of 20-30 mph.

Resource (Management Roads). A resource road would serve a specific destination and connect to local, collector, or arterial road systems. They may dead-end at single well/service facilities or serve small numbers of wells or facilities. Depending on the level of activity, a resource road could serve light traffic and very heavy loads. Authorization and use of resource roads are at the discretion of the landowner or agencies. The maintenance objective for resource roads would be to minimize resource damage. A resource road would be abandoned and reclaimed when the road is no longer needed. Occasionally a resource road could be stabilized and allowed to revert to a two-track trail.

Resource roads would be single lane roads with turnouts (14-16 ft wide after surfacing) with 4:1 ditches a minimum of 1 ft deep. Gravel, if needed, would be of sufficient quality to support heavy loads for short durations. The surface of a resource road is not required to be smooth. Resource roads would be designed for speeds of 15-30 mph.

Arterial collector, local, and resource roads in producing fields would be appropriately surfaced (e.g., aggregate, crushed rock) immediately following construction. Resource roads to exploratory well sites would be surfaced only after the well has been determined to be productive, unless otherwise directed by the BLM. Surfacing materials would be obtained from existing or newly constructed aggregate source pits located on federal, state, and/or private lands in or near the CD/WIIPA.

Roads across federal lands would be designed by a licensed professional engineer, as deemed appropriate by the BLM, and all roads would be constructed with adequate drainage and erosion control structures (e.g., relief culverts, drainage culverts, wing ditches, water bars). To further decrease potential impacts, the number and miles of roads would be limited by discouraging development of looped roads and by accessing well locations from short spurs off existing, local, and/or collector roads, where feasible. Roads would be closed and reclaimed by the operators when they are no longer required for the project unless otherwise directed by the BLM.

Approximately four people (i.e., road construction crews which are usually locally contracted by the operator) would be required for construction of each road, and each mile of road would require 3 days to complete (Table 2.3). During operations, roads would be maintained for year-round access. Road maintenance would typically include the application of surface materials and grading during the summer and fall months and snow removal during the winter. Further details on road construction and maintenance specifications are provided in the TP (Appendix B) and the TPTSD (BLM 1999a) for this project.

Available topsoil would be removed during road construction and placed on the backslope area of borrow ditches within road ROWs. Topsoil would be respread on approximately 11.5 ft of both sides of all roads and reseeded as soon as possible and within 2 years after production testing indicates the well would be a producer and pipelines are installed. The entire road ROW to unproductive wells and the entire well location would be reclaimed as soon as practical, and reclamation activities would normally be completed within 2 years using stockpiled topsoil and BLM-approved seeding techniques. All newly developed roads would be reclaimed upon project abandonment unless otherwise directed by the BLM in consultation with private landowners, county agencies, and other entities as necessary. Further road reclamation guidelines are provided in Appendix A.

2.6.2.2 Road Use

Estimated traffic requirements for the proposed project are presented in Table 2.4. Crews would use a crew vehicle or car pool. Approximately eight round trips per day would be required to each well during construction, drilling, completion, and testing phases (i.e., approximately the first 56 days of development at each well and including ancillary facilities). During production, wells would be visited twice a week on average. An additional three round trips per well per day for a 10-day period every 10 years would generally be required for workovers and well abandonment. Three round trips per day for 3 days would be required for reclamation of each well location.

Project-related traffic would be restricted to I-80, Wyoming Highway 789, Sweetwater County Roads 4-23 and 4-19, other county roads, other improved existing roads in the CD/WIIPA, and newly constructed or upgraded roads developed for the project. Use of unimproved roads would be allowed only in emergency situations. Operators would instruct project personnel and contractors to adhere to speed limits commensurate with road type, traffic volume, vehicle type, and site-specific condition to assure safe and efficient traffic flow. Signs would be placed along roads as directed by the BLM for travel restrictions and other standard traffic control information. All equipment and roads would be maintained to minimize impacts to air quality and noise and to ensure human safety.

2.6.3 Well Pad Construction

The typical well pad during drilling operations (for vertical, directional, and horizontal drilling operations) would be approximately 2.6 acres (Figure 2.2). Components of the well pad include a reserve pit to contain drilling fluids, cuttings, and water produced during drilling and a flare pit to be used during testing. All reserve pits would be constructed per BLM and/or WOGCC requirements to protect

Table 2.3 Estimated Employment Requirements, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Employment Category	No. Personnel for Each Well/ Operation Crew	Maximum No. Simultaneously Active Crews	Total No. Individuals	Total No. Person-years[1] Required for Maximum Development
Well Construction/Development				
Access road and well pad construction (5 days/location)	4	3	12	231
Rig transport and rig-up operations (4 days/well)	15	15	225	692
Drilling (20 days/well)	21	15	315	4,846
Completion/testing (15 days/well)[2]	11	15	165	1,904
Pipeline and ancillary facility installation (12 days/location)	6	6	36	831
Operations/Maintenance (30 years/well)				
Production (LOP)[3]	11	48	58	2,050
Workovers/abandonment (10 days every 10 years/well)[4]	7	7	49	2,423
Reclamation (3 days/location)	3	1	3	104
Total	--	--	863	13,081

[1] Assumes all wells are drilled and completed as producers, is based on 260 workdays per year, and assumes a well life of 30 years and a LOP of 50 years.

[2] Eight to 15 people are required during fracturing only; only one fracturing crew would be used.

[3] Includes three production foreman, 35 pumpers (30 years), three hauler crews, and three field clerks (1-person crews), two rig service crews (3-person crews), and two roustabout crews (4-person crews). Each well location would be visited twice per week on average, and 15-20 wells/locations could be visited daily by a single employee.

[4] The third workover would generally be for casing and plugging operations associated with well abandonment.

Table 2.4 Estimated Traffic Requirements[1], Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Type of Traffic	Round Trips per Well/Location	LOP Round Trips Required for Maximum Development (x 1,000)
Well Construction/Development		
Access road and well pad construction (5 days/location)	50	150
Gravel hauling	33	99
Rig transport and rig-up operations (4 days/well)	60	180
Drilling activities (20 days/well)	133	399
Completion/testing (15 days/well)	145	435
Pipeline and ancillary facility installation (12 days/location)	48	144
Total Well Construction/Development (56 days/location)	469	1,407
ADT[2]	8	0.3
Operations/Maintenance		
Operations (LOP)[3]	3,120	468
Workovers (10 days every 10 years/well)	90	270
Total Operations/Maintenance	3,210	738
ADT[2]	0.4	0.1
Total Reclamation (3 days/location)	9	27
GRAND TOTAL	3,688	2,172
ADT[2]	0.3	0.2

[1] Assumes all wells are drilled and completed as producers, wells produce every day, well life is 30 years, and the LOP is 50 years.

[2] ADT = average daily traffic.

[3] Each well location would be visited twice a week on average, and approximately 15-20 well locations could be visited daily by a single employee.

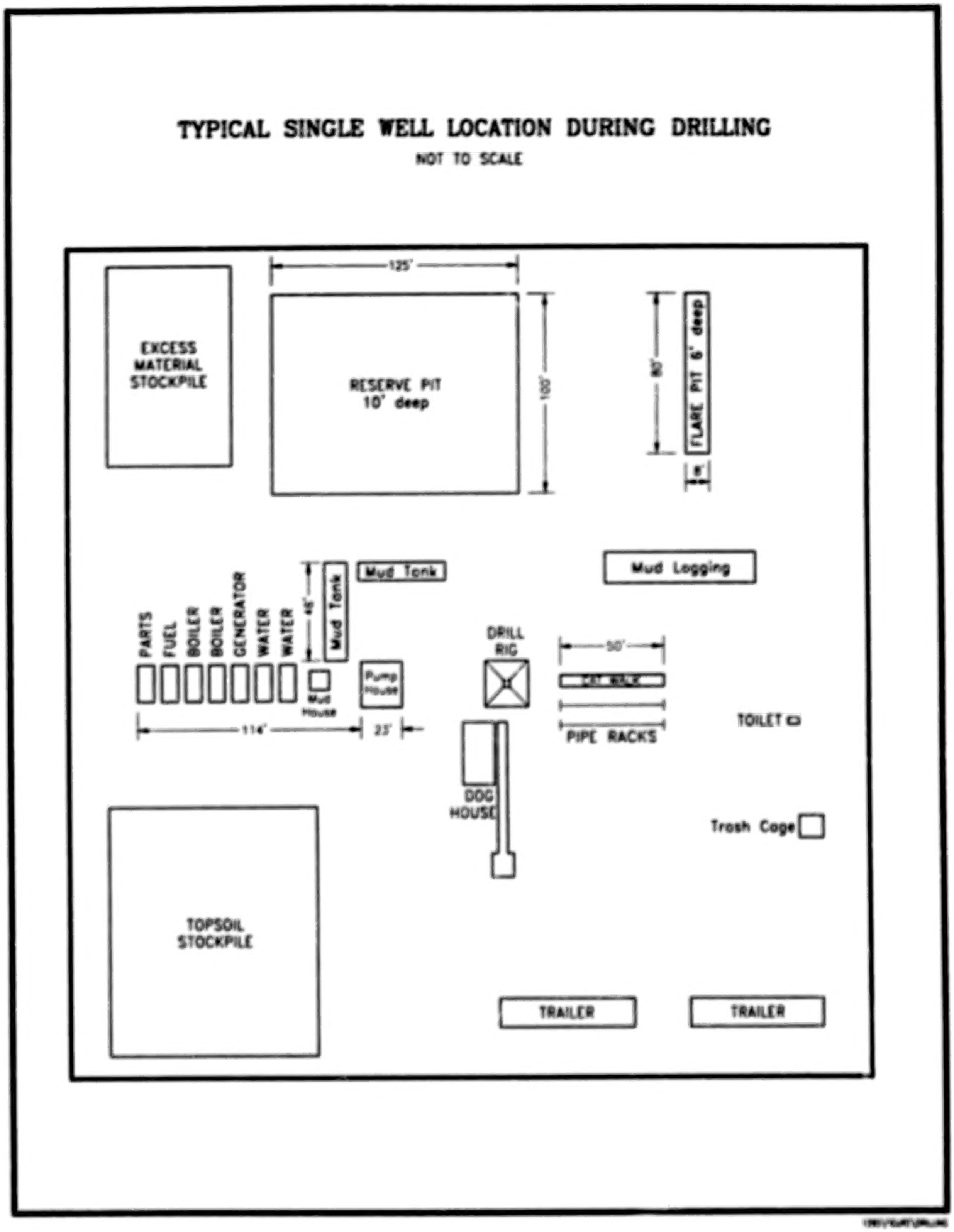

Figure 2.2 Typical Location Layout During Drilling, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

surface and ground water resources. Site-specific analyses conducted by the BLM during the APD process would determine whether lining of reserve pits with a synthetic liner would be necessary.

Well locations would be cleared of vegetation and topsoil, and these materials would be stockpiled together for future use in reclamation. The well location would be leveled using standard cut-and-fill construction techniques and machinery. At locations with level ground where minimal cut-and-fill is needed and/or where topsoil is saline and/or alkaline and its removal could create depressions capable of retaining water, the topsoil would be stripped only from the pit and spoil stockpile areas to facilitate future reclamation. In areas of rough terrain or where significant erosion/construction hazards exist, detailed engineering designs would be developed by a licensed professional engineer, and construction would be monitored as determined by the BLM. Well pad construction would require approximately 2 days per location, and approximately 20 round trips per location would be needed. Well pad construction crews would usually be contracted locally by the Operators.

Erosion control would be maintained through prompt revegetation and by constructing surface water drainage controls such as berms, diversion ditches, and sediment ponds as necessary at each well location. Stormwater Pollution Prevention Plans (SWPP Plans) would be prepared for all well locations, access roads, and other development sites that disturb more than 5 acres. In some cases, SWPP Plans may be prepared for groups of 20 or more wells.

2.6.4 Drilling Operations

Following access road and well pad construction, a rotary drilling rig would be moved to each location and erected on-site. Rig transport and on-site assembly would be completed in approximately 4 days, would involve approximately 15 people per site (Table 2.3), and would require approximately 60 round trips per site (Table 2.4).

An estimated maximum of 15 drilling rigs rated to accommodate anticipated final well depths of approximately 7,000 to 11,000 ft would be utilized. Some wells may be drilled to depths greater than 11,000 ft. Whereas vertical drilling would be the principle method employed, directional and/or horizontal drilling methods may be used to augment gas recovery or minimize surface disturbance in areas with sensitive environmental resources. However, directional and horizontal drilling have a greater risk and therefore a lower chance of economic success when compared to vertical drilling. Much of the CD/WIIPA is not well-suited for directional drilling (see Section 3.1.4.1). All drilling operations and other well site activities would be conducted in compliance with applicable BLM, WOGCC, WDEQ, and other relevant federal, state, and county rules and regulations (Table 1.1). Most wells would be completed in the Almond Formation (Mesa Verde Group); however, secondary reserves may be encountered in other formations (e.g., Lewis). Drilling would occur commensurate with new discoveries coupled with anticipated development costs and gas prices.

Drilling would begin in 1999, subsequent to the release of the ROD for this project, and continue until all proposed wells are drilled. Operators propose to drill throughout the year utilizing the mitigative measures and environmental considerations outlined in Section 2.6.13. Drilling each well would take approximately 20 days (some additional time may be required for directional/horizontal wells or wells drilled deeper than 10,000 ft) and would require approximately 21 individuals, including three 5-person rig operations crews necessary to conduct drilling throughout the entire 24-hr day (Table 2.3). Most project personnel would be hired locally, and all project-required personnel would likely reside in Rock Springs, Wamsutter, or Rawlins. No mancamps or other temporary housing is proposed within the CD/WIIPA. Approximately 133 round trips to each well location would be required during drilling operations.

Directional drilling provides for construction of one well location to accommodate as many as five wells. These multiple wells can be serviced by one access road and gathering system pipeline, as well as a single separation, dehydration, and storage facility. Use of multi-well directional drilling techniques would be contingent upon economic, technical feasibility, and environmental considerations.

Horizontal drilling involves drilling a curved section from the bottom of a vertical hole, followed by drilling horizontally in the productive formation. Horizontal drilling could increase gas flows, has been successfully utilized in other gas projects in Wyoming to improve the productivity of marginal wells, and may be applicable in portions of the CD/WIIPA.

Fresh water would be used for drilling the first 5,000 to 7,000 ft of each well, and water-based muds would be used for the remainder of the drilling operation. Drilling muds, cuttings, and water would be stored in the reserve pit (Figure 2.2). The reserve pit would be fenced on the three nonworking sides during drilling, and within 24 hrs after drilling is completed and the rig substructure is removed, the fourth side would be fenced to protect wildlife and livestock until the pit is reclaimed. Reserve pits would be lined to protect surface and ground water resources as directed by the BLM and/or WOGCC during the APD process. In compliance with BLM Informational Bulletin No. WY-93-054, netting (1-inch mesh) would be placed over reserve pits containing oil or other substances toxic to wildlife.

Approximately 630,000 gal of water would be used during the drilling of each well. This water would be obtained primarily from existing and newly drilled water supply wells in the CD/WIIPA. Approximately 50 new water supply wells would be drilled at natural gas well locations, and each water well would require approximately 0.5 acres of long-term (life-of-well) disturbance. Water wells would be generally located one per township, and disturbance associated with water wells would occur within the 2.6-acre initial disturbance area of natural gas well locations. All water supply wells would be permitted with the WSEO and would likely be drilled to depths of less than 1,000 ft.

Water would be trucked or piped to individual well locations, depending upon site-specific conditions, disturbance requirements, and time of year. Water pipelines would be temporary and would consist of either standard 3- to 6-inch diameter aluminum sections or polypipe which would be laid on the surface within road ROWs and would be removed upon completion of drilling and completion/testing operations.

When the reserve pit is no longer required, water would be evaporated; however, in some instances, pit contents may be mixed with suitable solid materials and the pit backfilled, as approved by the BLM or private entity. Prior to the mixing of reserve pit contents with approved stabilizing materials, appropriate closure permits would be obtained from the WOGCC/WDEQ. If necessary, reserve pit contents would be removed and disposed of at an approved disposal facility in a manner commensurate with all relevant county, state, and federal regulations and stipulations. The reserve pit area would be recontoured and reseeded as soon as possible (i.e., first appropriate season), but no later than 2 years after completion of drilling and testing operations. Further details on reserve pit reclamation are provided in Appendix A.

Human waste generated at well locations would be collected in standard portable chemical toilets or service trailers and regularly transported off-site to a county- and state-approved disposal site (e.g., Rawlins or Rock Springs wastewater treatment plants) or otherwise collected and disposed of as authorized by WDEQ. Each well location would be provided with one or more such facilities during drilling and completion operations lasting more than 3 days. A septic system would not be required. Nonhuman waste would be collected in enclosed containers and disposed of at state-approved sites (e.g., Wamsutter landfill).

2.6.5 Completion and Testing Operations

Well completion and testing operations entail:

- isolating near-surface fresh water aquifers with surface casing set at the start of drilling operations;
- casing and cementing various segments of the wellbore to protect fresh water aquifers by running steel pipe into the open borehole and cementing the pipe into place (Figure 2.3);
- perforating the casing adjacent to the target formation;
- fracture stimulating (fracturing or fracing) the target formation; and
- conducting postfracturing flow tests and cleanup.

Once drilling has been completed, the well would be logged and production casing set to prevent condensates, gas, and/or water movement from reservoir to reservoir and to isolate producing zones, thereby protecting all other zones penetrated by the well. Casing also prevents drill hole cave-in, confines

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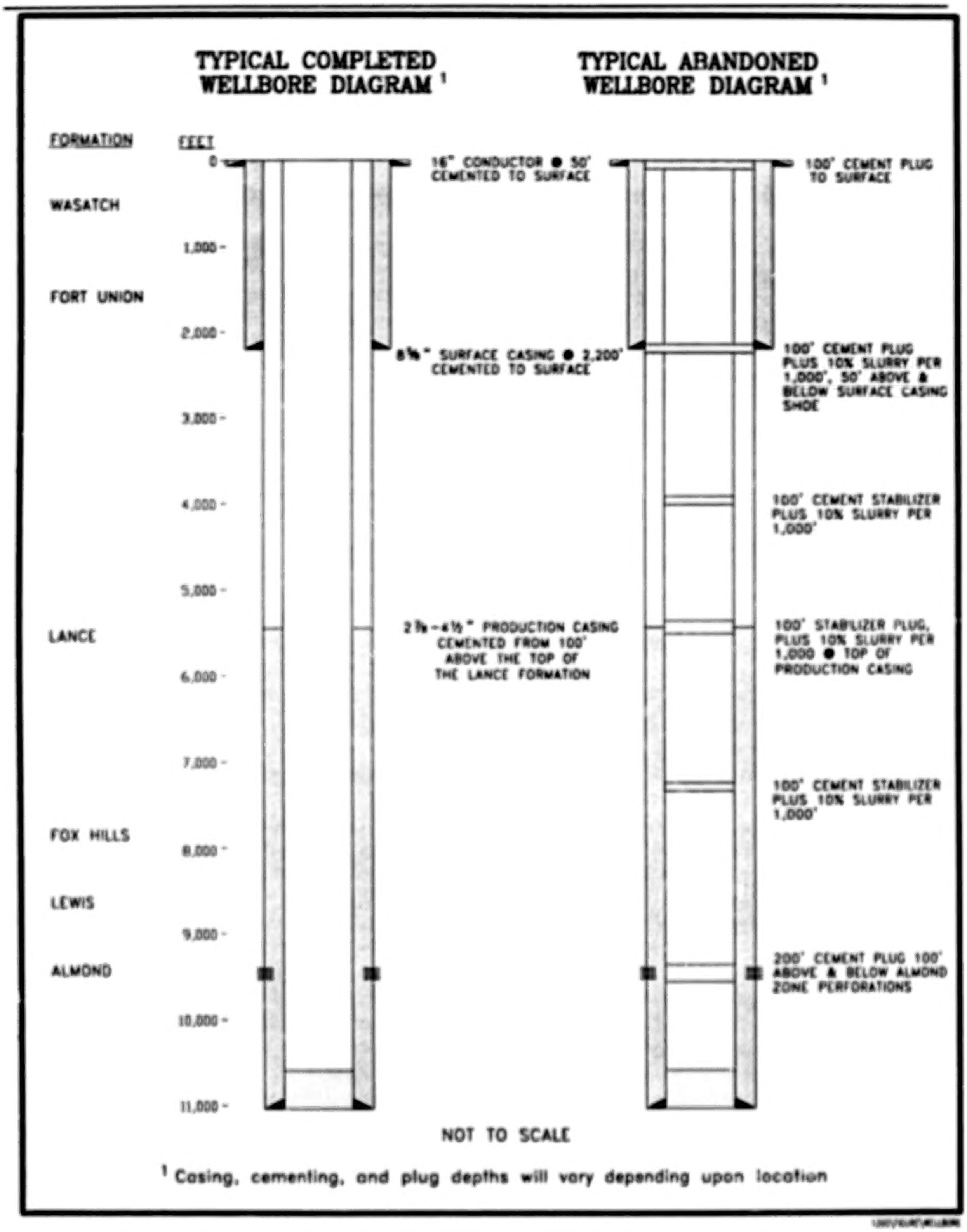
TYPICAL COMPLETED WELLBORE DIAGRAM [1]
TYPICAL ABANDONED WELLBORE DIAGRAM [1]
FORMATION
FEET
0
WASATCH
1,000
FORT UNION
2,000
3,000
4,000
5,000
LANCE
6,000
7,000
FOX HILLS
8,000
LEWIS
9,000
ALMOND
10,000
11,000
16" CONDUCTOR ● 50' CEMENTED TO SURFACE
8⅝" SURFACE CASING ● 2,200' CEMENTED TO SURFACE
2⅞-4½" PRODUCTION CASING CEMENTED FROM 100' ABOVE THE TOP OF THE LANCE FORMATION
100' CEMENT PLUG TO SURFACE
100' CEMENT PLUG PLUS 10% SLURRY PER 1,000', 50' ABOVE & BELOW SURFACE CASING SHOE
100' CEMENT STABILIZER PLUS 10% SLURRY PER 1,000'
100' STABILIZER PLUG, PLUS 10% SLURRY PER 1,000 ● TOP OF PRODUCTION CASING
100' CEMENT STABILIZER PLUS 10% SLURRY PER 1,000'
200' CEMENT PLUG 100' ABOVE & BELOW ALMOND ZONE PERFORATIONS
NOT TO SCALE
[1] Casing, cementing, and plug depths will vary depending upon location

Figure 2.3 Typical Completed and Abandoned Wellbore Diagrams, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

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production to the wellbore, and provides a means of controlling pressure to facilitate installation of surface and subsurface well equipment. All well casing and cementing operations on federal minerals would be conducted as directed by the BLM in compliance with BLM Onshore Oil and Gas Order No. 2. Well casing and cementing on state and patented minerals would be as directed by the WOGCC. Completion and testing operations would be similar for all wells, but may require additional time for directional and horizontal wells.

When casing and cementing have been completed, the well casing would be perforated in the producing formation (usually the Almond Formation) to allow the flow of hydrocarbons to the wellbore. Most completions in the CD/WIIPA and adjacent areas insert a string of tubing into the casing to the top of the perforated productive zone to allow gas, condensate, and water to flow to the surface where it is collected, measured, and contained.

After perforation, the well would be flowed an estimated 1-15 days to evaluate well performance. During testing, flows from the well, including gas and minor amounts of hydrocarbon liquids (condensates), would be flared to the flare pit pursuant to BLM/WOGCC rules and regulations (NTL-4A). Depending on the rates of these flow tests, the formation would be further evaluated for fracture stimulation. Flaring would also occur during flowback operations following fracturing.

Hydraulic fracturing is expected to be performed on most wells to increase gas flow rates by increasing the relative formation permeability. Nitrogen (N_2) or carbon dioxide (CO_2), water-based fluids, and proppants (i.e., granular materials such as sand) are pumped down the wellbore under high pressure and through perforations in the casing into the target formation. The pressurized fluid induces hydraulic fractures in the formation and, when the pressure is released, fluids return to the surface and the fractures partially close on the proppants, leaving channels for gas and liquids to flow into the wellbore. Fracturing fluids returned to the surface would be captured in temporary storage tanks or BLM-approved earthen pits. Fluids would either be evaporated on-site, hauled away from the location for reuse, or disposed of at an authorized facility. Decisions regarding the appropriate handling of fracturing fluids would be made by the BLM and/or WOGCC on a case-by-case basis.

Approximately 138,000 gal (0.42 acre-ft) of water per well would be needed for completion and testing operations. The total per well water requirement for all drilling, completion, and testing operations would be approximately 768,000 gal (2.4 acre-ft). Maximum LOP water requirements would be 2,304 million gal (7,072 acre-ft).

Estimated employment and traffic requirements necessary for completion and testing operations are presented in Tables 2.3 and 2.4, respectively. Typical completion and testing operations would take approximately 15 days per well and require a daily average of 11 individuals. Total round trips per well required for completion and testing operations are estimated at 145.

2.6.6 Production Facilities

Once a well has been tested and deemed to be commercially productive, it would be equipped for production. Figure 2.4 shows a typical single well location production facility. Reclamation of areas unnecessary for production operations--approximately 1.8 acres at each well location--would be completed, reducing disturbance at each location to approximately 0.8 acres for the LOP. Multiple well location production facilities would not vary substantially in size from a single well facility; however, locations with water wells would have approximately 1.3 acres of disturbance for the LOP. All aboveground production facilities at each location would be painted with standard environmental colors (e.g., Carlsbad Canyon) that blend with the surrounding landscape.

A series of valves designed to control pressures and regulate flows from the well (i.e., the christmas tree) would be installed at the well head. Flows from the wellbore would pass through the christmas tree to a separator where the gas would be separated from the condensates and water in the gas stream. Liquids would be diverted to storage tanks. Water remaining in the natural gas stream would be removed with a skid-mounted glycol dehydration system (i.e., dehydrator) and routed to an appropriately protected collection container. Natural gas would be directed to a collection or gathering system pipeline.

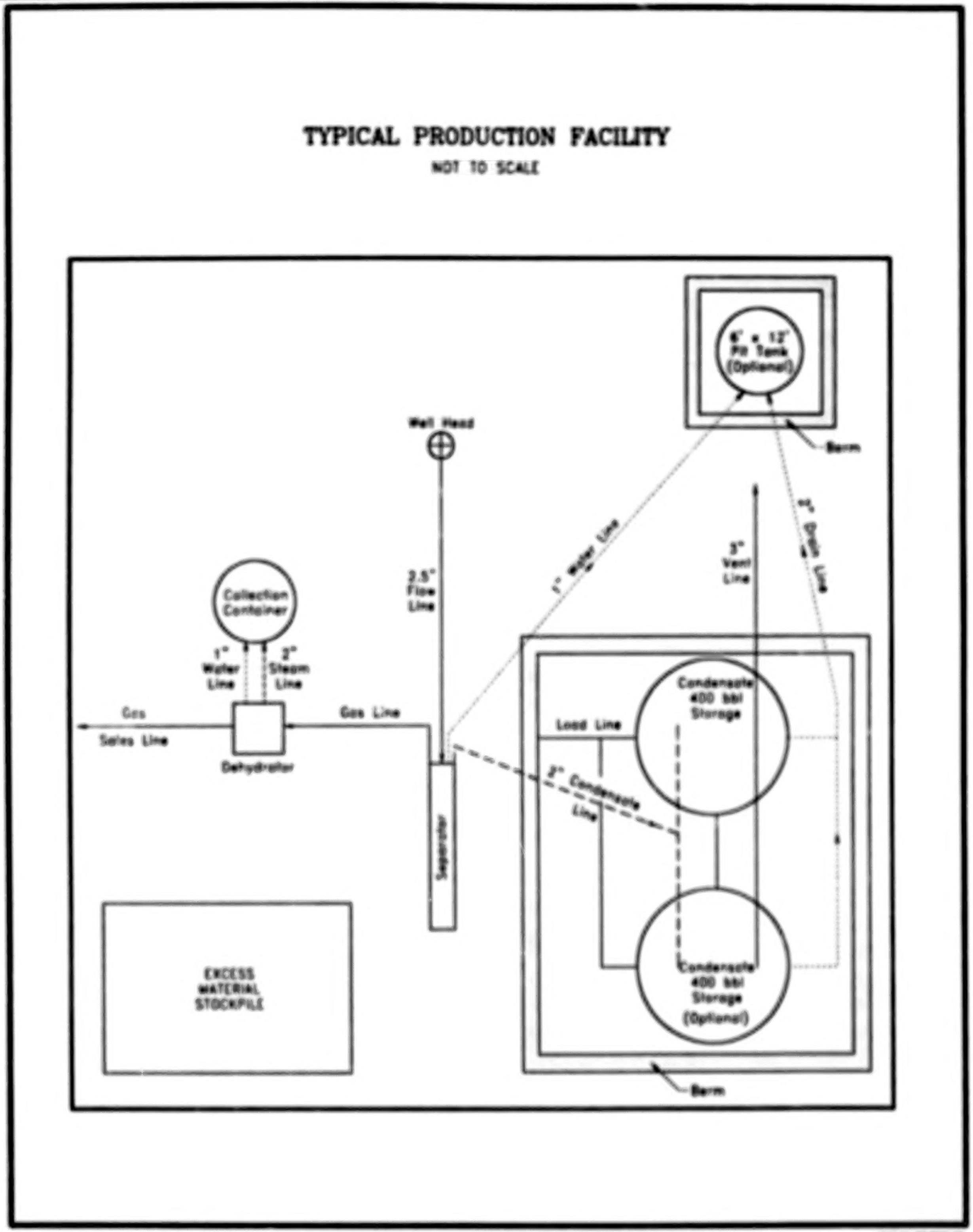

Figure 2.4 Typical Single Well Location Production Facility Schematic, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Natural gas production from wells in the CD/WIIPA is expected to range from approximately 0.25 to greater than 3.5 million cubic feet (mmcf) per day (mmcfd). Table 2.5 shows the typical content of gas produced from the Almond Formation in fields adjacent to the CD/WIIPA. No hydrogen sulfide (H_2S) is known from this formation, and none is expected to be encountered during project operations.

From less than 5 to 350 barrels (bbls) of condensate per day (bcpd) are expected to be produced from each well. Condensates consist primarily of long chain hydrocarbon liquids (e.g., pentanes, hexanes, heptanes, octanes) and would be stored in tanks at well locations (Figure 2.4). In compliance with 43 C.F.R. 3262 and 40 C.F.R. 112.7, all tank batteries would be bermed to contain the volume of the largest tank plus sufficient freeboard (≥1 ft) to handle precipitation. Condensates would be periodically removed from storage tanks and transported by truck for sale to refineries or piped to central processing facilities. Condensate would be transported from locations as necessary based upon production rates. It is anticipated that on average condensates would be transported from locations twice a month.

The volume of water produced at each well is expected to be less than 20 bbls per day and would average approximately 6 bbls per day. Water initially removed from the gas stream would be stored in a tank at the well location. The quality of this water would be variable. Water would be removed as necessary from the tank and transported by vacuum truck for disposal in permitted facilities according to WDEQ rules and regulations and BLM Onshore Oil and Gas Order No. 7.

All producing wells would be visited from one to five times each week for routine well operations. On average, each well location would be visited twice a week. The estimated employment requirements for well operations are presented in Table 2.3 and traffic requirements are presented in Table 2.4. The productive life of wells in the CD/WIIPA is expected to be from 5 to 30 years.

2.6.7 Pipelines

Most gas produced from wells would be transported from each location through newly constructed underground gathering system pipelines. These lines would be linked to larger existing interstate gas transportation pipelines in the CD/WIIPA (see Map 2.2). At present, it is assumed that existing interstate pipeline capacity would be adequate for the gas transportation needs required for this project. In the event that additional interstate pipelines become necessary, additional NEPA analyses would be conducted.

The exact location of newly proposed pipelines cannot be determined at present; however, industry standard pipeline equipment, materials, techniques, and procedures in conformance with all applicable regulatory requirements would be employed during construction, testing, operation, and maintenance of pipelines to ensure the safety and efficiency of pipelines in the CD/WIIPA. Depending upon the location of acceptable pipeline tie-ins, pipeline ROWS would be located adjacent to roads to minimize surface disturbance and maximize construction and gas transport efficiency (Figure 2.1). For the purpose of this analysis, surface disturbance calculations assumed all pipelines would parallel roads and that the maximum total pipeline and road disturbance width would be 80 ft (25 ft for pipelines and 55 ft for roads). However, pipelines may not follow roads based on environmental and/or economic considerations.

Pipeline ROW widths generally would be 50 ft, and an estimated 0.5-1.5 mi of pipeline would be required for each well on the CD/WIIPA. An average of approximately 1.5 mi of new pipeline would be required for each well during initial field development; however, in developed areas and as development proceeds in other areas, it is estimated that on average only 0.5 mi of pipeline would be required per well. New gas pipelines generally would be 3-6 inches in diameter and buried to depths of 4-6 ft. To provide additional protection of visual, habitat, and/or subsurface resources and to minimize surface disturbance, pipelines may be located aboveground in some areas. The estimated extent of surface disturbance associated with pipeline construction for this project is presented in Table 2.1.

Sufficient topsoil to facilitate reclamation would be removed from pipeline ROWs before construction. Where ROWs do not require major excavation, vegetation may be stripped to ground level (scalping) using mechanical treatments, leaving topsoil intact and

Table 2.5 Typical Gas Composition from the Almond Formation in Fields in and Adjacent to the Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Component	Creston/Blue Gap (%)	Greater Wamsutter Analysis Area (%)
Methane	85.98	81.54
Ethane	6.94	8.42
Carbon dioxide	3.15	3.24
Propane	2.40	4.16
Butane	0.52	0.84
Isobutane	0.46	0.87
Nitrogen	0.25	0.25
Isopentane	0.14	0.22
Pentane	0.13	0.17
Hexanes	0.03	0.18
Heptanes	0.00	0.08
Octanes	0.00	0.03
Total	100.00	100.00

[1] Adapted from BLM (1994a, 1995a).

minimizing disturbance to plant root systems, thereby facilitating vegetation reestablishment. All pipeline ROW reclamation would be initiated as soon as practical following disturbance, but would be completed within 2 years.

Hydrostatic testing would be utilized to ensure the integrity of newly constructed pipelines. This testing consists of filling pipeline segments with water and pressurizing the segments to levels exceeding operating pressures. If leaks or ruptures occur, they would be repaired and testing would be repeated until successful. Water used for hydrostatic testing would either be produced water or water acquired from WSEO-permitted ground water wells. After testing, this water would be pumped into tank trucks and reused for drilling or further pipeline testing, thereby avoiding the discharge of water on the ground surface. In some instances, produced water used for testing may be hauled to existing approved disposal facilities. Pipeline construction crews of approximately six persons would install an average of 850 ft of line per day (Table 2.3), and a 1.0 mi pipeline segment would require 6-7 days to complete. Approximately 3.0 acres of short-term disturbance would be required per mile of pipeline. The total estimated surface disturbance required for pipelines is presented in Table 2.1.

2.6.8 Ancillary Facilities

The proposed project would utilize existing compression, processing, water disposal, water well, and power line facilities to the maximum extent possible. Up to five compressor stations, one gas processing plant, 10 water evaporation ponds, five water disposal wells, and 50 water wells may be required as the field is developed. The exact locations of these facilities has not been determined; however, they would be situated and designed to minimize environmental impacts and maximize operations efficiency. Total maximum surface disturbance from ancillary facilities would be 144 acres for the LOP (rounded to 100 acres for analysis purposes).

Compression facilities would require a maximum of 4.0 acres each, and a maximum of five facilities would be required. Engines on the compressors would be fueled by natural gas and designed to minimize emissions, and typical stack height would be 24 ft. A total of 70,000 horsepower (hp) of compression may be required at four compression facilities spaced throughout the CD/WIIPA and at a facility located with the gas processing facility. Compression facilities would not be manned but would be lighted 24 hrs per day.

One natural gas processing facility may be required, or an expansion to an existing processing facility may occur. While Operators have no definite plans to add additional natural gas processing capacity at this time, this EIS assumes that one new processing facility would be constructed. The processing plant would be permitted and constructed by gas gathering companies and would be designed for dehydration, CO_2 removal, condensate removal, and cryogenic natural gas liquid condensation/extraction. A typical processing plant and associated ROWs would require approximately 30 acres. During initial development, existing processing at Wamsutter would be utilized and no new processing plants would be required; however, under maximum development (3,000 well locations), a new gas processing facility would be necessary.

Additional water disposal facilities may include a maximum of 10 evaporation ponds (3.4 acres surface disturbance per pond and 34 acres total surface disturbance) and five disposal wells (7 acres surface disturbance per disposal well and 35 acres total surface disturbance). Approximately 50% of water disposal would be by evaporation ponds and 50% by disposal wells. The exact location of these facilities has not been determined; however, evaporation ponds would be located off federal surface, would be permitted by WDEQ, and would be designed to minimize adverse environmental impacts and maximize operation efficiency. Evaporation ponds would generally consist of a 6-ft deep, 3.0-acre pit (350 x 350 ft), bermed to allow 3 ft of freeboard with an associated bermed tank farm. Pits would be clay-, clay/bentonite-, or geomembrane-lined and would have a leak detection system. Disposal wells would be 4,000-12,000 ft deep (Fox Hills and Almond Formations) and would be permitted by the WSEO, WOGCC, and/or WDEQ.

Fifty new water wells may be drilled to provide water for drilling. Water wells would be approximately 400 to 1,000 ft deep and would be situated at gas well locations, and each well would result in an additional 0.5 acres of LOP disturbance at natural gas well locations. Each water well would be permitted by the WSEO. While no surface or ground water in connection with surface water is proposed for use by this project, consultation with the USFWS would be conducted to determine appropriate mitigations for downstream T&E fish species if surface waters are depleted and/or these species could be impacted by water depletions. After drilling is completed, water wells could be: 1) left for the landowner to file a water right; 2) capped for future use by Operators; or 3) plugged and abandoned.

Aggregates to be used for road and well location construction would be acquired from suitable areas on federal, state, and private lands on and adjacent to the CD/WIIPA. Prior to aggregate extraction, appropriate permits would be obtained from the WDEQ-Land Quality Division (LQD) and federal sources as necessary. Site-specific NEPA documents would be required for aggregate extraction operations on federal lands. Further detail on the location of potential aggregate sources and the need for these materials is provided in the TPTSD for this project (BLM 1999a).

2.6.9 Geophysical Operations

Geophysical operations (i.e., seismic surveys), including 3-D surveys, velocity surveys, normal incident vertical seismic profiles, and/or offset vertical seismic profiles may be required during the LOP as drilling activity increases into areas of the CD/WIIPA with marginal or unknown gas reserves. The majority of these surveys would likely utilize 3-D seismic techniques and employ vibrator trucks or shothole methods. These surveys would be subject to separate environmental analyses for compliance with NEPA and are expected to cause minimal surface disturbance. Cultural resource inventories and other surveys for sensitive environmental resources would be conducted prior to implementation as directed by the BLM. Any geophysical operations conducted as a result of the project would be implemented using procedures specified in the BLM's GDRA and GRRA RMPs after receipt of BLM and/or WOGCC approval.

Geophysical exploration generally involves the use of an energy source (i.e., vibrator trucks or shotholes), geophones/receivers (listening devices), and computer processing equipment (recorder truck). Receivers are arranged in a grid pattern, with receiver line spacing usually 0.25 mi apart and geophone spacing at 220-ft intervals along the line. Energy source lines are generally 0.5 mi apart, with vibrating or shothole points at 220-ft intervals along the line. Shotholes are usually less than 250 ft deep, with diameters of 3.5-8.4 inches. Trucks ranging in size from the 26-ton vibrator trucks to 1-ton pickups would access lines using existing roads and cross-country travel. Backtracking would be kept to a minimum, and all-terrain vehicles (ATVs) and/or helicopters would be used to transport personnel and equipment in difficult terrain or areas designated as sensitive to vehicular traffic. Observation of recent 3-D geophysical operations conducted in similar areas show no long-term damage to vegetation and soils.

2.6.10 Hazardous Materials

The Operators have reviewed the EPA's Consolidated List of Chemicals Subject to Reporting Under Title III of the *Superfund Amendments and Reauthorization Act of 1986* (SARA) (as amended) to identify any hazardous substances proposed for production, use, storage, transport, or disposal by this project, as well as the EPA's List of Extremely Hazardous Substances as defined in 40 C.F.R. 355 (as amended), and have determined that materials listed as hazardous and/or extremely hazardous would be used or generated by this project (see Appendix C). A summary of this information (BLM 1998a) is available for review at the BLM RFO and RSFO.

Hazardous materials anticipated to be used or produced during the implementation of the proposed project generally can be included in the following categories: drilling materials, casing and cementing materials, fracturing materials, production products, fuels, combustion emissions, and miscellaneous materials (BLM 1998a).

Operators and their contractors/subcontractors would comply with all applicable hazardous material laws and regulations and would locate, handle, and store hazardous substances in an appropriate manner to prevent them from contaminating sensitive resources.

Notice of any spill or leakage, as defined in BLM NTL 3A, would be immediately reported by the Operator to the BLM and other federal and state officials (e.g., WDEQ) as required by law. Incidents requiring verbal notification by regulation would be given as soon as possible, but no later than 24 hrs after the discovery of the incident. Verbal notification would be confirmed in writing within 15 days or other such time required by the appropriate regulatory agency. Any release of hazardous substances (leaks, spills, etc.) in excess of the reportable quantity, as established by 40 C.F.R. 117, would be reported as required by the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*, (CERCLA) as amended (42 U.S.C. 9601 et seq.). If the release of a hazardous substance in a reportable quantity does occur, a copy of the report would be furnished to the BLM and all other appropriate federal and state agencies.

Each Operator would also prepare and implement, as necessary, the following plans and/or policies:

- pursuant to 40 C.F.R. 112, Spill Prevention, Control, and Countermeasure (SPCC) Plans prepared for those sites where SPCC Plans are applicable;
- Spill Response Plans (oil/condensate);
- plans and inventories of hazardous chemical categories pursuant to Section 312 of SARA, as amended; and
- Emergency Response Plans.

Copies would be maintained with the Operators, as required by regulation, and would be made available for review upon request.

2.6.11 Operations and Maintenance

2.6.11.1 Maintenance

All roads, wells, pipelines, and ancillary facilities would be operated in a safe and efficient manner according to industry standards. Routine maintenance of producing wells would be necessary to maximize performance and detect potential difficulties. Typically, each well location would be visited once or twice a week to ensure operations are proceeding efficiently. All roads and well locations would be inspected periodically by the BLM and maintained by Operators to minimize erosion and assure safe operating conditions. Work force and traffic requirements for project operations are presented in Tables 2.3 and 2.4, respectively.

2.6.11.2 Workovers

Approximately once every 10 years, each well would require a workover to change or replace tubing, re-fracture producing formations, clear water and other debris from the wellbore and perforations, and/or recomplete the well in another potentially productive zone not completed at the time the well was first drilled. While some wells may never require workovers and others may need workovers more than once every 10 years, wells would generally require three workovers each, and the third workover would be conducted at well abandonment (see Section 2.6.12). On average, workovers would require a crew of seven workers for 10 days (Table 2.3) and approximately 30 round trips (Table 2.4). Workovers would be conducted primarily during daylight hours, and the BLM would be consulted prior to initiating workovers (e.g., Sundry Notice) on federal lands in crucial wildlife areas during critical periods.

2.6.12 Reclamation and Abandonment

Reclamation would be conducted on all disturbed lands in compliance with BLM's *Wyoming Policy on Reclamation* (BLM 1990b), and the reclamation guidelines presented in Appendix A. Erosion control, restoration, and revegetation plans would be prepared by Operators on a site-specific basis during the APD and ROW application process, and these plans would be approved by the BLM prior to site disturbance. The short-term reclamation goal would be to stabilize disturbed areas as rapidly as possible, whereas the long-term goal would be to return the land to conditions approximating those which existed prior to disturbance.

Reclamation would occur during two phases. After production facilities are installed, reclamation would be initiated on unnecessary portions of productive well locations (approximately 1.8 acres/location) and road ROWs to these locations (approximately 11.5 ft along each side of the road). Reclamation of all disturbed surface areas along pipeline ROWs would also be initiated. These reclamation activities would begin as soon as practical following disturbance (e.g., the first appropriate season), and reclamation, including grading, ripping, retopsoiling, and reseeding, would be completed within 2 years. This initial reclamation would reduce the amount of disturbed area to that necessary for production operations.

When an Operator is ready to abandon a well, an abandonment plan would be submitted to BLM, and if acceptable, the BLM would approve and authorize activities through a Sundry Notice. The well would be plugged according to BLM Onshore Oil and Gas Order No. 2 or WOGCC rules and regulations (WOGCC 1998). Figure 2.3 shows a typical plugged and abandoned wellbore schematic. Reclamation for all abandoned or shut-in well locations and access roads would be initiated as soon as practical, according to BLM specifications, and reclamation activities would be completed within 2 years. This reclamation would include leveling and recontouring of disturbed areas, soil ripping, redistribution of topsoil over disturbed areas, installation of water diversion and/or erosion control devices, and reseeding. Reclamation would follow guidelines presented in Appendix A and specified in APD Surface Use Plans and/or ROW Plans of Development.

At the end of the project's useful life (estimated at 30-50 years), Operators would obtain all necessary authorizations from the appropriate regulatory agencies and/or landowners to abandon facilities. All aboveground facilities would be removed, and all unsalvageable materials would be disposed of at authorized sites. Wells would be permanently or temporarily plugged or shut-in, according to BLM and/or WOGCC recommendations (Figure 2.3). Pipelines would be purged of combustible materials and abandoned in place or removed, based on authorizing agency or landowner specifications. The well pad would be reclaimed and revegetated as outlined in Appendix A and site-specific APD Surface Use Plans. Roads would be reclaimed according to procedures identified in Appendix A and/or ROW Plans of Development, unless they are determined to be left in place by the authorizing agency or private landowner. Any excess topsoil from roads that would

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not be reclaimed would be used to reclaim well pads. Regrading, ripping (12 to 18 inches), topsoiling, and revegetation would be completed. Proposed seed mixtures (Appendix A), as approved by the BLM, would be broadcast or drill seeded. Reclaimed and abandoned locations and ROWs would revert to appropriate agency or landowner control.

2.6.13 Applicant-Committed Mitigation/ Environmental Protection Measures

The following applicant-committed mitigation measures, design features, and procedures would be implemented by Operators to minimize impacts to the environment. Each mitigation measure is listed only once, under the first resource where it applies; however, many mitigation measures apply to several resources and would reduce impacts to each. Mitigation measures may be waived when deemed inappropriate by the BLM if a thorough analysis determines that the resource(s) for which the measure was developed would not be impacted. Further site-specific mitigation measures would be identified during APD and ROW application review processes. To assure compliance with mitigation measures stipulated in this EIS and in APDs and ROW applications, each Operator would provide a qualified individual available during construction/drilling operations. This individual would consult with the BLM on a case-by-case basis as necessary during field development.

All of the proposed applicant-committed mitigation/ environmental protection measures identified in this section would be implemented on all federal lands under all alternatives except No Action. Implementation of these measures on state and private lands would be subject to state or landowner preferences and agreements with individual Operators, and where these measures are not implemented additional impacts may occur. Development activities on all lands, including those implemented under No Action, would be conducted in accordance with all appropriate federal, state, and county laws, rules, and regulations.

2.6.13.1 Preconstruction Planning and Design Measures

1. Operators and the BLM would conduct on-site IDT inspections of each proposed disturbance site (e.g., well sites, roads, pipelines, etc.) to develop site-specific recommendations and mitigation measures.
2. Operators would adhere to the specifications, guidelines, and development protocol identified in the TP for this project (Appendix B). Annual updates to the TPTSD would be prepared by Operators and approved by the BLM prior to the initiation of any road improvement/construction (see Appendix B and BLM 1999a). Road construction and maintenance agenda and the responsible Operators would be updated annually in the TPTSD to accommodate tentative developments proposed for the next calendar year. Proposed maintenance and development plans would be reviewed annually by the BLM, Operators, landowners, and the Carbon County and Sweetwater County Road Departments. Roads on federal lands required for the proposed project would be in accordance with BLM Manual 9113 guidelines (BLM 1985, 1991a).
3. Operators would prepare and submit individual drill site design plans to the BLM for approval prior to initiation of construction. These plans would show the layout of the well location over the existing topography, dimensions of the pad, volumes and cross sections of cut-and-fill, location and dimensions of reserve and flare pits, and access road design.
4. Prior to construction, operators would submit a Surface Use Plan or a Plan of Development for each well site, pipeline segment, and access road project. These plans would detail the measures and techniques to be used for erosion control, revegetation, and restoration and would adhere to reclamation guidelines present in Appendix A. The plan would provide specific detail on project administration, time frames, responsible parties, objectives, characteristics of site predisturbance conditions, topsoil removal, storage and handling, runoff and erosion control, seed bed preparation, seed mixes, seed application, fertilization, mulching, site protection, weed and livestock or other herbivore control, and monitoring and maintenance.

5. Detailed engineering would be conducted for construction activities on steep and/or unstable slopes when required by the BLM and would receive approval by the BLM prior to initiating construction.
6. Operators would identify aggregate and other surfacing material sources, for use in drill site and road construction, in annual updates to the TPTSD (BLM 1999a). The appropriate surface management agency (usually the State of Wyoming) would approve these sources, including timing for extraction, prior to use.

2.6.13.2 Air Quality

1. All BLM conducted or authorized activities (including natural gas development alternatives) must comply with applicable ambient air quality regulations and standards. Operators would adhere to all applicable Wyoming Ambient Air Quality Standards (WAAQS), National Ambient Air Quality Standards (NAAQS), and permit requirements (including preconstruction, testing, and operating permits), motorized equipment and other regulations, as required by the WDEQ-Air Quality Division (AQD).
2. Operators would not allow open burning of garbage or refuse at well locations or other facilities in the CD/WIIPA. Any other open burning would be conducted under the permitting provisions of Section 13 of the Wyoming Air Quality Standards and Regulations (WDEQ-AQD 1989).
3. On federal land and during times of high use (i.e., construction, drilling, and workover operations), Operators would initiate immediate abatement of fugitive dust (by application of water, chemical dust suppressants, or other measures) when air quality, soil loss, or safety concerns are identified by the BLM or the WDEQ-AQD. These concerns include but are not limited to potential exceedances of applicable air quality standards. The BLM would approve control measures, locations, and application rates. If watering is the approved control measure, Operators would obtain the water from state-approved sources.

2.6.13.3 Topography and Physiography

1. Operators would incorporate in their Surface Use Plans and Plans of Development the reclamation procedures and specifications contained in *Standard Practices Applied to Surface-Disturbing Activities* (BLM 1992:Appendix 7-2), the Reclamation Plan for this project (Appendix A), and guidelines for road construction contained in BLM Manual, Section 9113 (BLM 1985, 1991a), TP (Appendix B), and TPTSD (BLM 1999a).
2. Areas with high erosion potential and/or rugged topography (i.e., steep slopes [>25%], stabilized sand dunes, floodplains, erosive and sandy soils) would be avoided where possible, or specialized mitigation measures to control erosion would be applied.
3. Upon completion of construction and/or production activities, Operators would restore the topography to near pre-existing contours at well sites, access roads, pipelines, and other facility sites.

2.6.13.4 Geological/Paleontological Resources

1. Geologic risks would be minimized by implementing site-specific alignment variations for roads, pipelines, and drill pads to avoid and/or minimize disturbances to unstable areas.
2. BLM/WOGCC casing and cementing criteria would be followed to protect all subsurface mineral- and water-bearing zones.
3. If paleontological resources are discovered by Operators or any person working on their behalf, at any time during construction, construction activities that could potentially disturb these resources would cease and the BLM would be notified immediately. In compliance with paleontological resource management guidelines (BLM 1998b, 1998c), the BLM would arrange for a determination of significance and, if necessary, recommend a recovery or avoidance plan. Mitigation of paleontological resources would be on a case-by-case basis, and the Operator would incur all costs. Surface-disturbing activity would not resume until a Notice to Proceed is issued by the BLM.

2.6.13.5 Soils

1. Prior to commencement of well location construction, all available topsoil (up to 12 inches) would be stripped from cut, fill, stockpile, and pit areas, and salvaged topsoil would be stockpiled for future reclamation operations.
2. Operators would keep the area of disturbance to the minimum necessary for drilling activities and subsequent production activities while providing for safety.
3. Operators would restrict off-road vehicle activity by employees and contract workers.
4. Operators would restrict project-related travel during periods when soils are saturated and excessive rutting (e.g., >4 inches) could occur.
5. Where feasible, Operators would locate pipelines immediately adjacent to roads or other pipelines to avoid creating separate areas of disturbance.
6. Operators would minimize construction activities in areas of steep slopes (e.g., >25%) and sand dunes and would apply special slope-stabilizing structures and techniques in accordance with applicable geotechnical data (e.g., mulch, revegetation) if construction cannot be avoided in these areas.
7. Operators would not conduct construction activities using frozen or saturated soils, unless an adequate plan is submitted and approved by the BLM that demonstrates potential impacts would be mitigated.
8. Operators would minimize disturbance to vegetated cuts and fills on new and existing roads.
9. Runoff and erosion control measures such as water bars, berms, and interceptor ditches would be installed as necessary (see Appendix A).
10. All drainage crossing structures would be designed to carry at least a 10-year/24-hr storm event, pursuant to guidelines in BLM Manual, Section 9113 (BLM 1985, 1991a).
11. Operators would replace topsoil or suitable growth materials over all disturbed surfaces prior to revegetation.
12. Operators would revegetate all disturbed sites as soon as practical following disturbance (see Appendix A).

2.6.13.6 Water Resources

1. Construction at drainage crossings would be limited to periods of low or no flow.
2. Operators would follow all practical alternatives and designs to limit disturbance within drainage channels, including ephemeral and intermittent draws.
3. Channel crossings by pipelines would be constructed so that the pipe is buried at least 4 ft below the channel bottom.
4. Channel crossings by roads and pipelines would be constructed perpendicular to flow.
5. Disturbed channel beds would be reshaped to their approximate original configuration.
6. All disturbances to wetlands and/or waters of the U.S. would be coordinated with the U.S. Army Corps of Engineers (COE), and Section 404 permits would be secured as necessary prior to disturbance.
7. A 500-ft wide buffer area of undisturbed land would be left between construction sites and perennial channels or open water areas.
8. A 100-ft wide buffer area of undisturbed land would be left between construction sites and ephemeral and intermittent channels.
9. All reserve pits would be constructed in cut or stabilized fill material.
10. Subsurface material at all reserve pits would be inspected by BLM as deemed necessary during construction to assess stability and permeability to determine the need for pit reinforcement or lining. If directed by the BLM and/or the WOGCC, a synthetic liner would be installed.
11. Reserve pits that contain materials potentially hazardous to the environment (see Appendix C and BLM [1998a]) would be lined if they are located at sites where ground water occurs within 20 ft of the surface or where potential ground or surface water could be contaminated.
12. If reserve pit leakage is detected, reserve pit use at the site would be curtailed, as directed by the BLM, until the leakage is corrected.

13. All reserve pits would be designed with at least 1.0 ft of free board.
14. All water used in association with this project would be obtained from WSEO-permitted ground water wells.
15. The discharge of all water (stormwater, produced water) would be done in conformance with WDEQ-WQD, BLM, and WOGCC rules and regulations (WDEQ 1978; BLM Onshore Oil and Gas Order No. 7).
16. Concentrated water flows within access road ROWs would be managed utilizing best management practices as described in Appendix A.
17. Operators would prepare SWPP Plans for all disturbances greater than 5 acres in size as required by WDEQ National Pollutant Discharge Elimination System (NPDES) permit requirements. In some instances, SWPP Plans for groups of wells may be developed.
18. Operators would implement SPCC Plans, where applicable, in accordance with 40 C.F.R. 112.
19. BLM/WOGCC casing and cementing criteria would be followed to protect all subsurface mineral- and water-bearing zones.

2.6.13.7 Noise and Odor

Operators would ensure that all motorized equipment is muffled and maintained.

2.6.13.8 Vegetation

1. Operators would finance site-specific surveys for federally listed T&E, candidate, and proposed plant species and plant species of special concern (former USFWS Category 2 candidate species) prior to any surface disturbance in areas determined by the BLM to contain potential habitat for such species (BLM Directive USDI-BLM 6840). These surveys would be completed by a qualified botanist as authorized by the BLM, and this botanist would be subject to BLM's special status plant survey policy requirements. Data from these surveys would be provided to the BLM, and if any T&E, candidate, proposed, or special status plant species or their habitats are found, BLM recommendations for avoidance or mitigation would be implemented. Minor relocation of project facilities would be made to avoid these species and/or their habitat. If avoidance is not possible, informal consultation with the USFWS would be initiated, as necessary.
2. Herbicide applications would be kept at least 500 ft from known special status plant populations.
3. Removal or disturbance of vegetation would be kept to a minimum through construction site management (e.g., by utilizing previously disturbed areas, using existing ROWs, designating limited equipment/materials storage yards and staging areas, scalping, etc.).
4. Operators would seed and stabilize disturbed areas in accordance with the reclamation guidelines presented in Appendix A.
5. Operators would monitor for noxious weeds and would apply BLM-approved weed control techniques (e.g., soil sterilants, biological controls), as necessary.
6. Operators would evaluate all project facility sites for occurrence of waters of the U.S., special aquatic sites, and wetlands, per COE requirements. All project activities would be located outside of these sensitive areas, where practical.
7. Where wetlands, riparian areas, streams, and ephemeral/intermittent stream channels must be disturbed, COE Section 404 permits would be obtained as necessary, and the following measures would be employed.
    a. Wetland areas would be crossed during dry conditions (i.e., late summer, fall, or dry winters); winter construction activities would occur only prior to soil freezing or after soils have thawed.
    b. Streams, wetlands, and riparian areas disturbed during project construction would be restored to pre-project conditions, and if impermeable soils contributed to wetland formation, soils would be compacted to reestablish impermeability.
    c. Wetland topsoil would be selectively handled.
    d. Recontouring and BLM-approved species would be used for reclamation.

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e. Reclamation activities would begin on disturbed wetland areas immediately after completion of project activities.

2.6.13.9 Wildlife and Fisheries

1. Operators would support and implement activities as defined in the Wildlife Protection Plan for this project (see Appendix D).
2. Operators would not perform construction activities in big game crucial winter ranges from November 15 to April 30, unless specifically allowed by the BLM.
3. Wildlife-proof fencing would be constructed around areas potentially hazardous to wildlife (e.g., reserve pits, toxic material storage locations) as deemed necessary by the BLM.
4. Wildlife-proof fencing would be utilized on reclaimed areas if it is determined that wildlife species are impeding successful vegetation establishment.
5. Reserve, workover, and evaporation/production pits potentially hazardous to wildlife would be adequately protected (e.g., fenced, netted) to prohibit wildlife access as directed by the BLM and to ensure protection of migratory birds and other wildlife.
6. ROW fencing associated with this project would be kept to a minimum, and if necessary, fences would meet BLM and WGFD approval for facilitating wildlife movement.
7. Operators would implement policies designed to control poaching and littering and would notify all employees (contract and company) that conviction of a major game violation could result in disciplinary action. Contractors would be informed that any intentional poaching or littering within the CD/WIIPA could result in dismissal.
8. Operators would internally enforce existing drug, alcohol, and firearms policies.
9. Any power line construction would follow recommendations by the APLIC (1994, 1996) and Olendorff et al. (1981) to avoid collisions and electrocution of raptors and other avifauna.
10. USFWS and WGFD consultation and coordination would be conducted as necessary for all mitigation activities related to raptors and T&E species (and their habitats), and all permits required for movement, removal, and/or establishment of raptor nests would be obtained.
11. Proposed disturbance within 1.0 mi of identified raptor nests would be surveyed by a qualified biologist to determine activity status prior to commencement of drilling and construction during raptor nesting periods. If an active raptor nest is identified within 0.25 to 1.0 mi (depending upon species and line of sight) of a proposed site, Operators would restrict construction during the critical nesting season for that species.
12. Operators would not conduct surface-disturbing activities within 0.25 mi of active sage grouse leks.
13. Operators would limit construction activities between March 1 and June 30 within a 2.0-mi radius of active sage grouse leks on suitable sage grouse nesting habitat as determined during on-site reviews of proposed development areas.
14. Site-specific surveys for federally listed T&E, candidate, and proposed animal species and animal species of special concern would be conducted prior to surface disturbance in areas determined by the BLM to contain potential habitat for such species. These surveys would be completed by a qualified biologist as authorized by the BLM. Data from these surveys would be provided to the BLM, and if any T&E, candidate, proposed, or special status animal species or their habitats are found, BLM recommendations for avoidance or mitigation would be implemented. Minor relocation of project facilities would be made to avoid these species and/or their habitats. If avoidance is not possible, informal consultation with the USFWS would be initiated, as necessary.
15. Mountain plover habitats (e.g., cushion plant communities, playa lakes) would be avoided where practical, and where these habitats would be disturbed, reclamation would utilize procedures designed to re-establish suitable plover habitat as directed by the BLM. Furthermore, mountain plover surveys would be conducted within suitable plover habitat on the CD/WIIPA by a qualified biologist in accordance with USFWS guidelines and as

directed by the BLM. The survey procedures would include the following.

- Visual observation of areas within 656 ft (200 m) of proposed disturbance would be made from stationary vehicles and/or ATVs to detect the presence of plovers. All plovers located would be observed long enough to determine if a nest is present.
- Surveys would be conducted no more than 14 days prior to the date actual ground-disturbing activities begins. If two surveys are required, they would be made at least 14 days apart, with the last survey no more than 14 days prior to the start-up date.
- The number of surveys required to clear a site for mountain plovers prior to beginning a planned activity depends on the start-up date, as shown below.

Date of Planned Activity	# Surveys Required
March 15 - March 31	1
April 1 - June 30	2
July 1 - August 15	1

- If an active plover nest is found in the survey area, the planned activity would be delayed at least 37 days or 1 week post-hatching. If a brood of flightless chicks is observed, activities would be delayed at least 7 days.
- Road construction and maintenance (i.e., grading) activities would be minimized from May 25 to June 30.
- Where practical, no new surface-disturbing activities would be conducted from April 1 to June 30 within 656 ft of identified mountain plover concentration areas (i.e., areas where broods and/or adults have been observed in the current year or documented in at least 2 of the past 3 years).

16. Operators would consult with the USFWS and/or the BLM to determine if black-footed ferret searches are required. When ferret searches are required, they would be conducted in accordance with USFWS guidelines (USFWS 1989).
17. Where possible, proposed disturbance areas would avoid prairie dog colonies which meet black-footed ferret habitat size and burrow density criteria (USFWS 1989).
18. No surface water or shallow ground waters in connection with live surface waters would be utilized for the proposed project.
19. Pursuant to the *Endangered Species Act*, Operators would adhere to all survey, mitigation, and monitoring requirements identified in the Biological Assessment (BA) for this project (see Appendix E).

2.6.13.10 Cultural and Historic Resources

1. Operators would adhere to the Section 106 compliance process (36 C.F.R. 800) or National Cultural Programmatic Agreement (NCPA) and Wyoming State Protocol (WSP) prior to any surface-disturbing activity.
2. Operators would halt construction activities in potentially affected areas if previously undetected cultural resource properties are discovered during construction. The BLM would be immediately notified, consultation with the SHPO and Advisory Council would be initiated as necessary, and proper mitigation measures would be developed pursuant to the WSP under the NCPA, or 36 C.F.R. 800.11. Construction would not resume until a Notice to Proceed is issued by the BLM.
3. Provisions similar to those of the *Oregon/Mormon Pioneer National Historic Trails Management Plan* (BLM 1986) or newly developed cultural resource management plans would be followed for any actions potentially affecting the Overland Trail, Cherokee Trail, and/or Lincoln Highway.
4. Operators would pay the costs of BLM-required mitigation for cultural resources.

2.6.13.11 Socioeconomics

Operators would implement hiring policies that encourage the use of local or regional workers.

2.6.13.12 Livestock/Grazing Management

1. Operators would coordinate project activities with ranching operations to minimize conflicts with livestock movement or other ranch operations.
2. Operators would maintain all fences, cattle guards, and other livestock-related structures required for their transportation network.
3. In areas of high livestock use, reclaimed area fencing would be utilized as necessary to ensure successful vegetation establishment.

2.6.13.13 Land Status/Use

Roads, power lines, and pipelines would be located adjacent to existing compatible linear facilities wherever possible.

2.6.13.14 Recreation

1. Operators would post appropriate warning signs and require project vehicles to adhere to appropriate speed limits on project-required roads.
2. Operators would inform their employees, contractors, and subcontractors that long-term camping (greater than 14 days) on federal lands or at federal recreation sites is prohibited.
3. Operators would direct their employees, contractors, and subcontractors to abide by all state and federal laws and regulations regarding hunting and artifact collecting.

2.6.13.15 Transportation

1. Detailed practices and procedures as specified in the TP for this project (Appendix B) would be followed. Annual TPTSD updates (BLM 1999a) would be developed and would identify the minimum road network required to support annually proposed project activities, as well as construction and maintenance responsibilities of the Operators. Annual TPTSD updates would also identify dust abatement, road construction, and surfacing requirements.
2. Existing roads would be used to the maximum extent possible and upgraded as necessary.
3. All Operator-constructed roads not required for routine operation and maintenance of producing wells or ancillary facilities would be reclaimed as directed by the BLM, State Land Board, or private landowner. As necessary, these roads would be permanently blocked, recontoured, reclaimed, and revegetated by Operators, as would disturbed areas associated with permanently plugged and abandoned wells.
4. Where required by the BLM, site-specific centerline surveys and/or detailed construction designs would be submitted to and approved by the BLM prior to road construction.
5. Operators would comply with existing federal, state, and county requirements and restrictions to protect road networks and the traveling public.
6. Special arrangements would be made with the WDOT to transport oversize loads to the CD/WIIPA. Otherwise, load limits would be observed at all times to prevent damage to existing road surfaces.
7. All development activities along approved ROWs would be restricted to areas authorized in the approved ROW.
8. Operators would be responsible for maintenance of roads in the project area and for closure of roads following production activities.
9. Where proposed roads would follow existing roads, those portions of existing roads not included in the new ROW would be reclaimed and revegetated by the Operator.
10. Available topsoil (up to 12 inches) would be stripped from all road corridors prior to commencement of construction activities and would be redistributed and reseeded on backslope areas of the borrow ditch after completion of road construction activities. Borrow ditches would be reseeded in the first appropriate season after initial disturbance.

2.6.13.16 Visual Resources

1. Operators would utilize existing topography to screen roads, pipeline corridors, drill rigs, wells, and production facilities from view where possible.

2. Operators would paint all aboveground production facilities with appropriate colors (e.g., Carlsbad Canyon or Desert Brown) to blend with the adjacent terrain, except for structures that require safety coloration in accordance with Occupational Safety and Health Administration (OSHA) requirements.

2.6.13.17 Health and Safety/Hazardous Materials

1. Operators would utilize WDEQ-approved portable sanitation facilities at drill sites.
2. Operators would place warning signs near potentially hazardous areas (e.g., well locations, ancillary facilities) and along roadways.
3. Operators would place appropriate dumpsters at each construction site to collect and store garbage and refuse.
4. Operators would ensure that all refuse and garbage is transported to a State of Wyoming-approved sanitary landfill for disposal.
5. Each operator would institute a Hazard Communication Program for its employees and would require subcontractor programs in accordance with OSHA (29 C.F.R. 1910.1200).
6. Operators would keep on file, at the field office, a Material Safety Data Sheet (MSDS) for every chemical or hazardous material that is brought on-site in accordance with 29 C.F.R. 1910.1200.
7. SPCC Plans would be written and implemented where applicable in accordance with 40 C.F.R. 112.
8. Chemical and hazardous materials would be inventoried and reported in accordance with the SARA Title III (40 C.F.R. 335). If quantities exceeding 10,000 pounds or the threshold planning quantity (TPQ) are to be produced or stored, the appropriate Section 311 and 312 forms would be submitted at the required times to the State and County Emergency Management Coordinators and the local fire departments.
9. Any hazardous wastes, as defined by the *Resource Conservation and Recovery Act of 1976*, (RCRA) as amended, would be transported and/or disposed of in accordance with all applicable federal, state, and local regulations.

2.7 SUMMARY OF ENVIRONMENTAL IMPACTS

A summary of impacts and mitigations for the four alternatives analyzed in this EIS (i.e., Proposed Action, Alternative A--14.0 acres maximum surface disturbance per federally managed section in SRAs, and Alternative B--30.0 acres maximum surface disturbance per federally managed section in SRAs, and No Action) is provided in Table 2.6. A detailed analysis of project impacts and mitigation measures is presented in Chapter 4.0.

Table 2.6 Summary of Impacts, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Impact by Environmental Resource	**Post-Applicant-Committed Mitigation Impacts**				
	Proposed Action	**Alternative A**	**Alternative B**	**No Action**	**Mitigation(s)**
			AIR QUALITY		
Increases in criteria and hazardous air pollutant emissions	Insignificant - compliance with state and national ambient air quality standards (LOP)	Same as Proposed Action	Same as Proposed Action	No impact above allowable levels and reduced from Proposed Action	Obtain all applicable air pollutant emission permits; limit compressor NO$_x$ emissions to 2 g/hp-hr; achieve 50% control of fugitive dust during construction with application of water/chemical dust suppressants
Air Quality-Related Values (AQRV) - visibility impacts "just-noticeable change" threshold	Insignificant - no significant adverse direct impacts; 1 day above Rawah PSD Class I Wilderness Area background levels (at 1.68 deciview) predicted from all cumulative sources combined; not likely to occur given "reasonable but conservative" modeling assumptions	Same as Proposed Action	Same as Proposed Action	No impact above allowable levels and reduced from Proposed Action	No additional mitigation required
AQRV - visibility impacts USFS threshold (one half of a "just-noticeable change")	Insignificant - no significant adverse direct impacts; 1 day above Rawah PSD Class I Wilderness Area background levels (at 1.68 deciview) and 1 day above Savage Run PSD Class II Wilderness Area background levels (at 0.67 deciview) predicted from all cumulative sources combined; not likely to occur given "reasonable but conservative" modeling assumptions	Same as Proposed Action	Same as Proposed Action	No impact above allowable levels	No additional mitigation required

Table 2.6 (Continued)

Impact by Environmental Resource	Post-Applicant-Committed Mitigation Impacts				
	Proposed Action	Alternative A	Alternative B	No Action	Mitigation(s)
			AIR QUALITY (Continued)		
AQRV - atmospheric deposition (acid rain) impacts	Insignificant - no significant adverse direct or cumulative impacts	Same as Proposed Action	Same as Proposed Action	No impact above allowable levels	No additional mitigation required
			TOPOGRAPHY/PHYSIOGRAPHY		
Cuts and fills at well locations and along roads	Insignificant - no major landscape alterations; site-specific (LOP); 22,400 acres initial disturbance and 8,300 acres of LOP disturbance	Insignificant - reduced from Proposed Action on federal lands in SRAs; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - intermediate between Proposed Action and Alternative A in SRAs; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; impacts could increase from those of Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts; 6,400 acres initially and 2,400 acres of LOP disturbance	Avoidance of prominent features and areas of high erosion potential; adherence to transportation planning guidelines (see Appendix B); restoration to pre-existing contours at well sites, access roads, pipelines, and other facility sites; minimize disturbance areas
Alteration of surface drainages	Insignificant - no long-term modifications to drainages (LOP)	Insignificant - reduced from Proposed Action on federal lands in SRAs; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - intermediate between Proposed Action and Alternative A in SRAs; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; could increase from those of Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts	Avoidance of drainages where possible; re-establishment, reclamation, and monitoring of impacted drainages; appropriate road and culvert design; acquisition of Section 404 permits as appropriate
			MINERALS/GAS AND OIL		
Depletion of gas and condensate reserves	Significant - near 100% depletion of reserves (permanent); 3 trillion cubic ft of gas and 500 million bbl of oil	Same as Proposed Action	Same as Proposed Action	Significant - violation of lease agreements; availability of future oil and gas reserves	None
Depletion of aggregate sources for road and facility site surfacing	Insignificant - additional sources would be identified	Same as Proposed Action	Same as Proposed Action	No impact above existing allowable levels	Identification of additional aggregate sources

Table 2.6 (Continued)

Impact by Environmental Resource	Post-Applicant-Committed Mitigation Impacts				
	Proposed Action	**Alternative A**	**Alternative B**	**No Action**	**Mitigation(s)**
			MINERALS/GAS AND OIL (Continued)		
Localized temporary loss of access to other mineral resources (e.g., coal, coalbed methane)	Insignificant - no active operations (LOP); gas production would become more prevalent	Insignificant - reduced from Proposed Action on federal lands in SRAs; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action on federal lands in SRAs; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; potentially increased from those of Proposed Action and Alternatives A and B due to the absence of coordinated transportation planning efforts	Avoidance of potential future mine/quarry sites, where practical
			GEOLOGIC HAZARDS		
Flood damage to pipelines and facilities	Insignificant (LOP)	Insignificant - reduced from Proposed Action; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; impacts could increase from those of Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts	Avoidance of floodplains and flood-prone areas, where possible (500 ft from open water, 100 ft from ephemeral/intermittent drainage channels)
Reactivation of stabilized dunes due to ground cover removal, inadequate reclamation	Significant (LOP and until adequate reclamation is achieved), on disturbed portions of the CD/WIIPA where stabilized dunes occur (1,300 acres initially and 600 acres LOP)	Insignificant - reduced from Proposed Action; surface disturbance limitations applied in SRAs which include stabilized dunal areas; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; surface disturbance limitations applied in SRAs which include stabilized dunal areas; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; impacts could increase from those of Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts	Avoidance of dunes where possible; appropriate and timely reclamation, erosion control, and revegetation; adherence to project- and site-specific reclamation guidelines; reclamation success monitoring
Earthquake damage to pipelines and facilities	Insignificant - low earthquake potential (LOP)	Insignificant - same as Proposed Action	Insignificant - same as Proposed Action	No impact above existing allowable levels	Well and pipeline construction made to withstand moderate earthquakes

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Table 2.6 (Continued)

Impact by Environmental Resource	Post-Applicant-Committed Mitigation Impacts				
	Proposed Action	Alternative A	Alternative B	No Action	Mitigation(s)
			GEOLOGIC HAZARDS (Continued)		
Land slides and slumping at construction sites	Insignificant (LOP)	Insignificant - reduced from Proposed Action; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; could be augmented increase from those of Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts	Avoidance of unstable areas where possible; appropriate and timely reclamation and erosion control
Mobilization of radioactive materials	Insignificant (LOP)	Same as Proposed Action	Same as Proposed Action	No impact above existing allowable levels	Appropriate containment, disposal, and monitoring of drill cuttings
			PALEONTOLOGICAL RESOURCES		
Disturbance/ destruction of important fossils	Insignificant (during construction) - 22,400 acres of new initial disturbance	Insignificant - reduced from Proposed Action; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels	Avoidance, recovery, and/or monitoring as determined during preconstruction BLM paleontological surveys
Loss of important fossil materials due to private collection or vandalism	Insignificant (LOP)	Insignificant - reduced from Proposed Action; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels	Avoidance, recovery, and/or monitoring as determined during preconstruction BLM paleontological surveys
Discovery of previously unknown fossils	Beneficial (during construction)	Potential reduced from Proposed Action; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Potential reduced from Proposed Action; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Potential reduced from Proposed Action	None

Table 2.6 (Continued)

Impact by Environmental Resource	**Post-Applicant-Committed Mitigation Impacts**				
	Proposed Action	**Alternative A**	**Alternative B**	**No Action**	**Mitigation(s)**
			SOILS		
Disturbance and erosional loss of soils during vegetation stripping, topsoil salvaging and stockpiling, and cut-and-fill operations	Insignificant - 1,300 acres new initial disturbance, 660 acres of LOP of sandy soils and less than 350 acres new initial disturbance of erosive soils, less than 190 acres LOP	Insignificant - reduced from Proposed Action; surface disturbance limitations applied on federal lands in SRAs which include stabilized dunal areas; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; surface disturbance limitations on federal lands in SRAs which include stabilized dunal areas; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; could be augmented from those of Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts	Avoidance of erosion-prone areas where possible; appropriate and timely use of erosion and sedimentation control techniques/devices; adherence to project- and site-specific erosion control and reclamation guidelines; minimize disturbance areas during drilling and production activities
Soil compaction and decreased productivity	Insignificant - during construction and LOP	Insignificant - reduced from Proposed Action; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Negligible - reduced from Proposed Action but increased from Alternative A; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; could be augmented from those of Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts	Use of appropriate reclamation techniques; restrict off-road vehicle travel
Contamination due to accidental hazardous material spills	Insignificant (LOP)	Insignificant - reduced from Proposed Action; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels	Adherence to spill prevention and control countermeasure plans, and other applicable local, state, and federal rules and regulations
Reactivation of stabilized sand dunes due to ground cover removal and inadequate reclamation	Significant - 1,300 acres of initial and 660 acres of long-term disturbance	Insignificant - reduced from Proposed Action; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Significant - potentially increased from those of Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts	Adherence to reclamation guidelines and prompt revegetation to restabilized sand dunes

Table 2.6 (Continued)

Impact by Environmental Resource	Post-Applicant-Committed Mitigation Impacts				
	Proposed Action	Alternative A	Alternative B	No Action	Mitigation(s)
			SOILS (Continued)		
Mobilization of potentially toxic elements	Insignificant	Insignificant - reduced from Proposed Action; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - potentially increased from those of Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts	Application of erosion control, soil stabilization, and reclamation measures
			SURFACE WATER RESOURCES		
Increased turbidity, salinity, and sedimentation of surface waters due to runoff from disturbed areas (e.g., roads)	Insignificant (LOP) - increased erosion and runoff from disturbed areas	Insignificant - reduced from Proposed Action; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; potentially increased those of the from Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts	Use of appropriate erosion and sedimentation control techniques/devices; adherence to project- and site-specific guidelines
Loss of proper functioning condition; decreased conditions in functioning at-risk drainages	Significant - increased sedimentation and salinity in Antelope/Bitter Creek	Significant - increased sedimentation and salinity in Antelope/Bitter Creek	Significant - increased sedimentation and salinity in Antelope/Bitter Creek	Significant - potentially increased from those of Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts	Use of appropriate erosion and sedimentation control techniques/devices; adherence to project- and site-specific guidelines
Contamination of surface waters from accidental hazardous material spills	Insignificant (LOP)	Insignificant - same as Proposed Action	Insignificant - same as Proposed Action	No impact above existing allowable levels	Adherence to spill prevention and control countermeasure plans
Surface water depletions	Insignificant (LOP) - less than 100 acre-ft/yr would be required for LOP	Insignificant - same as Proposed Action	Insignificant - same as Proposed Action	No impact above existing allowable levels	None

Table 2.6 (Continued)

Impact by Environmental Resource	Post-Applicant-Committed Mitigation Impacts				Mitigation(s)
	Proposed Action	Alternative A	Alternative B	No Action	
SURFACE WATER RESOURCES (Continued)					
Contamination of surface waters from discharge of unsuitable quality produced water	Insignificant (LOP)	Insignificant - reduced from Proposed Action; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels	Appropriate disposal of poor quality produced water; adherence to NPDES permit requirements
GROUND WATER RESOURCES					
Contamination of ground water from discharge of produced water, accidental hazardous material spills, and/or cross aquifer mixing through well bores	Insignificant (LOP)	Insignificant - same as Proposed Action	Insignificant - same as Proposed Action	No impact above existing allowable levels	Appropriate containment of materials; adherence to spill prevention and control countermeasure plans; adherence to WOGCC/BLM well drilling, casing, reserve pits, and abandonment requirements
Reduced ground water availability from withdrawal of drilling water	Insignificant (LOP and until aquifers recharged) - 7,022 acre-ft would be required for project	Insignificant - same as Proposed Action	Insignificant - same as Proposed Action	No impact above existing allowable levels	None

Table 2.6 (Continued)

Impact by Environmental Resource	Post-Applicant-Committed Mitigation Impacts				Mitigation(s)
	Proposed Action	Alternative A	Alternative B	No Action	
			NOISE		
Increased noise levels near residences and within crucial wildlife habitats during critical periods	Generally insignificant but significant if residents are displaced (during construction and LOP); noise levels less than 100 dBA at their source and less than 60 dBA at 0.25 mi; no surface disturbances within 0.25 mi of sage grouse leks and restricted activity within 2.0 mi during nesting season	Same as Proposed Action but reduced from Proposed Action (during construction and LOP); development limitations applied in SRAs which include areas proximal to residences, high-density raptor nesting areas, and crucial big game winter ranges; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Same as Proposed Action but reduced from Proposed Action and increased from Alternative A (during construction and LOP); development limitations applied in SRAs which include areas proximal to residences, high-density raptor nesting areas, and crucial big game winter ranges; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; potentially increased from those of Proposed Action and Alternatives A and B due to the absence of coordinated wildlife, reclamation, and transportation planning efforts	Avoidance of residences where practical; no drilling or construction activities within crucial wildlife habitats during critical periods; use of equipment mufflers; employee education
			ODOR		
Presence of offensive odors associated with drilling and production operations and proximal to facilities and roads	Insignificant - no hazardous (H_2S) odors would be produced, other odors would be dispersed by the wind	Insignificant - reduced from Proposed Action; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels	Regular equipment maintenance; avoidance of residential areas where practical
			VEGETATION		
Removal of vegetation	Insignificant where reclamation efforts are successful; 33,600 acres initial disturbance and 15,900 acres LOP disturbance	Insignificant - reduced from Proposed Action (LOP); impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A (LOP); impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; potentially increased from Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts	Minimize number and size of disturbance areas; appropriate and timely reclamation, erosion control, and revegetation; adherence to project- and site-specific reclamation guidelines including reclamation success monitoring

Table 2.6 (Continued)

Impact by Environmental Resource	Post-Applicant-Committed Mitigation Impacts				Mitigation(s)
	Proposed Action	**Alternative A**	**Alternative B**	**No Action**	
			VEGETATION (Continued)		
Changes in vegetation diversity following reclamation (i.e., shrubland to gracsland) and potential weed infestation	Insignificant where reclamation efforts are successful; 33,600 acres initial disturbance and 15,900 acres LOP disturbance	Insignificant - reduced from Proposed Action (LOP); impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A (LOP); impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; increased from those of Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts	Appropriate weed control; restrict off-road vehicle travel; revegetation with native/ approved species; adherence to project- and site-specific reclamation guidelines including reclamation success monitoring
Disturbance of wetlands and riparian areas	Insignificant - no net loss of wetlands (LOP); maximum LOP disturbance of <150 acres in shrub-dominated riparian areas and <100 acres in wetlands	Insignificant - no net loss of wetlands (LOP)	Insignificant - no net loss of wetlands (LOP)	No impact above existing allowable levels; increased from those of Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts	Avoidance of wetlands where possible; obtain COE Section 404 permits as necessary; adherence to project- and site-specific reclamation criteria
Reclamation unsuccessful after 5 years	Insignificant (LOP) may be inhibited by arid conditions and/or other limitations during some years	Insignificant - reduced from Proposed Action; surface disturbance limitations applied in SRAs which include areas of difficult reclamation (e.g., dunal areas); impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; surface disturbance limitations applied in SRAs which include areas of difficult reclamation (e.g., dunal areas); impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; potentially increased from those of Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts	Adherence to project- and site-specific reclamation success and monitoring guidelines; further BLM approved reclamation efforts until successful revegetation achieved

Table 2.6 (Continued)

Impact by Environmental Resource	**Post-Applicant-Committed Mitigation Impacts**				**Mitigation(s)**
	Proposed Action	**Alternative A**	**Alternative B**	**No Action**	
			VEGETATION (Continued)		
Reactivation of dunal areas due to removal of vegetation	Significant - 1,300 acres initial and 660 acres LOP surface disturbance in dunal areas	Insignificant - reduced from Proposed Action; surface disturbance limitations applied in SRAs which include dunal areas; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; surface disturbance limitations applied in SRAs which include dunal areas; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; potentially increased from those of Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts	Adherence to site-specific reclamation success and monitoring guidelines
			WILDLIFE		
Loss of big game crucial habitat	Insignificant - new initial disturbance of 1,066 acres pronghorn crucial range, 378 acres mule deer crucial range, and 585 acres elk crucial range (LOP and until areas successfully reclaimed)	Insignificant - reduced from Proposed Action; surface disturbance limitations applied in SRAs which include big game crucial winter ranges; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; surface disturbance limitations applied in SRAs which include big game crucial winter ranges; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; potentially increased from those of Proposed Action and Alternatives A and B due to the absence of coordinated wildlife, reclamation, and transportation planning efforts; maximum estimated LOP of 2,400 acres of big game crucial winter ranges	Minimize project activities in these areas; avoidance of crucial ranges during critical periods; appropriate reclamation with shrub species; employee education
Loss of sage grouse productivity	Insignificant; new initial disturbance of 11,000 acres and LOP 5,700 acres of probable nesting habitat (963 proposed wells)	Insignificant - reduced from Proposed Action; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; potentially increased from those of Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts	Minimize project activities in breeding and nesting areas (0.25-mi buffer); appropriate reclamation with shrub species; employee education

Table 2.6 (Continued)

Impact by Environmental Resource	Post-Applicant-Committed Mitigation Impacts				
	Proposed Action	**Alternative A**	**Alternative B**	**No Action**	**Mitigation(s)**
			WILDLIFE (Continued)		
Loss of raptor productivity	Significant - nest abandonment and reproductive failure; new initial disturbance of 6,300 acres and 3,300 acres LOP within 1.0-mi raptor nesting buffer (549 well locations)	Insignificant - reduced from Proposed Action; surface disturbance limitations applied in SRAs which include raptor nesting concentration areas; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; surface disturbance limitations applied in SRAs which include raptor nesting concentration areas; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; increased from those of Proposed Action and Alternatives A and B due to the absence of coordinated wildlife and transportation planning efforts	Implementation of nesting surveys; avoidance of nesting buffer during critical periods; use of artificial nesting structures as appropriate; employee education
Indirect disturbance (displacement and/or stress)	Significant - increased human activity would decrease the amount of habitat available for some species	Insignificant - reduced from Proposed Action; surface disturbance limitations applied in SRAs which include important wildlife habitats; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; surface disturbance limitations applied in SRAs which include important wildlife habitats; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; increased from those of Proposed Action and Alternatives A and B due to the absence of coordinated wildlife and transportation planning efforts	Avoid construction and other activities within crucial habitats during critical periods; employee education
Increased wildlife mortality from activities of man	Insignificant (LOP)	Insignificant - reduced from Proposed Action; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; increased from those of Proposed Action and Alternatives A and B due to the absence of coordinated wildlife and transportation planning efforts	Appropriate road design; employee education; appropriate containment and disposal of hazardous material; appropriate measures (i.e., fencing) to restrict access at reserve, evaporation, and flare pits; adherence to transportation planning guidelines

Table 2.6 (Continued)

Impact by Environmental Resource	Post-Applicant-Committed Mitigation Impacts				Mitigation(s)
	Proposed Action	Alternative A	Alternative B	No Action	
WILDLIFE (Continued)					
Overall wildlife habitat degradation	Insignificant - LOP disturbance of 552 acres pronghorn crucial range, 196 acres mule deer crucial range, and 303 acres elk crucial range	Insignificant - reduced from Proposed Action; surface disturbance limitations applied in SRAs which include important wildlife habitats; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; surface disturbance limitations applied in SRAs which include important wildlife habitats; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels	Appropriate erosion control and timely reclamation; appropriate monitoring, containment, and disposal of hazardous material; avoidance of crucial habitats during critical periods
WILD HORSES					
Wild horse displacement or mortality due to habitat loss or other activities of man; loss of forage	Insignificant - 13,100 acres new initial disturbance and 6,300 acres LOP disturbance within five Wild Horse Herd Management Areas (WHHMAs)	Insignificant - reduced from Proposed Action; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; potentially increased from Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts	Employee education; appropriate and timely revegetation; adherence to reclamation and transportation planning guidelines
THREATENED, ENDANGERED, AND SENSITIVE SPECIES					
Mortality or disturbance of any listed or candidate T&E species or disturbance of critical habitat for listed and candidate T&E species	Insignificant/no adverse effects - no known bald eagle or peregrine falcon nests or roosts; no confirmed black-footed ferret sightings; no surface water withdrawal (LOP)	Insignificant/no adverse effects - reduced from Proposed Action; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant/no adverse effects - reduced from Proposed Action but increased by from Alternative A; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; could increase from those of Proposed Action and Alternatives A and B due to the absence of coordinated reclamation, transportation, and wildlife protection planning efforts	Minimize habitat disturbance; avoid prairie dog colonies and other appropriate habitats where possible; implementation of black-footed ferret surveys as required; predisturbance surveys; compliance with USFWS protection measures specified in the BA; appropriate and timely reclamation and revegetation; employee education

Table 2.6 (Continued)

Impact by Environmental Resource	Post-Applicant-Committed Mitigation Impacts				Mitigation(s)
	Proposed Action	Alternative A	Alternative B	No Action	
THREATENED, ENDANGERED, AND SENSITIVE SPECIES (Continued)					
Reductions in other sensitive species and/or species of concern due to mortality or habitat removal	Insignificant (LOP) - most species (see also Wildlife, above)	Insignificant - reduced from Proposed Action (see also Wildlife, above); impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A (see also Wildlife, above); impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; could increase from those of Proposed Action and Alternatives A and B due to the absence of coordinated reclamation, transportation, and wildlife protection planning efforts	Predisturbance surveys; avoidance of habitats of potential occurrence where possible; employee education
CULTURAL RESOURCES					
Disturbance/ destruction of important sites	Insignificant (LOP) - segments of the Overland Trail would be avoided, disturbance would be restricted or prohibited within 0.25 mi or of visual horizon of historic trails, 9% of the CD/WIIPA has been surveyed	Insignificant - reduced from Proposed Action; surface disturbance limitations applied in SRAs which include areas of high site density; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; surface disturbance limitations applied in SRAs which include areas of high site density; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; could increase from those of Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts	Cultural surveys, data recovery, programmatic agreements, and/or discovery plan implementation as required; adherence to coordinated reclamation and transportation planning efforts
Loss of important cultural materials due to private collection or vandalism	Insignificant (LOP)	Insignificant - reduced from Proposed Action; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels	Employee education; disciplinary action as appropriate
Disturbance of important Native American religious or culturally significant sites	Insignificant - no known sites occur on area (LOP)	Insignificant - reduced from Proposed Action; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels	Consultation and coordination with Native American tribes as necessary

Table 2.6 (Continued)

Impact by Environmental Resource	Post-Applicant-Committed Mitigation Impacts				Mitigation(s)
	Proposed Action	**Alternative A**	**Alternative B**	**No Action**	
			SOCIOECONOMICS		
Increase in population	Insignificant - adequate infrastructure exists (LOP); maximum of 753 workers during project development, then 50-60 workers during production phase	Insignificant - reduced from Proposed Action	Insignificant - reduced from Proposed Action but increased from Alternative A	No impact above existing allowable levels	Employment of as many local personnel as possible
Increase in demand for temporary housing	Insignificant - numerous vacancies exist (LOP)	Insignificant - reduced from Proposed Action	Insignificant - reduced from Proposed Action but increased from Alternative A	No impact above existing allowable levels; potentially increased from those of Proposed Action and Alternatives A and B due to the absence of reclamation, transportation, and wildlife protection planning efforts	Employment of as many local personnel as possible
Increase in demand for local government facilities or services	Insignificant - adequate infrastructure exists and increased revenues would be available (LOP)	Insignificant - reduced from Proposed Action	Insignificant - reduced from Proposed Action but increased from Alternative A	No impact above existing allowable levels; potentially increased from those of Proposed Action and Alternatives A and B due to the absence of reclamation, transportation, and wildlife protection planning efforts	Employment of as many local personnel as possible
Disruption or change of character of communities	Significant - if project area residents are displaced due to noise, odor, visual or aesthetic impacts occurs (LOP)	Insignificant - reduced from Proposed Action; surface disturbance limitations in SRA which include rural residential areas; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; surface disturbance limitations in SRA which include rural residential areas; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; potentially increased from those of Proposed Action and Alternatives A and B due to the absence of reclamation, transportation, and wildlife protection planning efforts	Employment of as many local personnel as possible

Table 2.6 (Continued)

Impact by Environmental Resource	Post-Applicant-Committed Mitigation Imparts				Mitigation(s)
	Proposed Action	**Alternative A**	**Alternative B**	**No Action**	
			SOCIOECONOMICS (Continued)		
Increase in tax revenue and royalties and stimulation of local economy	Significant beneficial - increased federal, state, and local revenues (LOP)	Significant beneficial - reduced from Proposed Action	Significant beneficial - reduced from Proposed Action but increased from Alternative A	Significant adverse - if project curtailed, decreased revenues	None
Increase in traffic and degradation of roads	Insignificant	Insignificant - reduced from Proposed Action; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; potentially increased from those of Proposed Action and Alternatives A and B due to the absence of transportation planning efforts	Adherence to transportation planning efforts; employee education
			LAND USE		
Reduction of AUMs for livestock, wild horses, and wildlife	Insignificant - initial loss of 1,856 AUMs (LOP); grass forage production would increase following reclamation	Insignificant - reduced from Proposed Action; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; could increase from those of Proposed Action and Alternatives A and B due to the absence of coordinated reclamation, transportation, and wildlife protection planning efforts	Appropriate and timely reclamation; revegetation with palatable and productive species; adherence to project- and site-specific reclamation guidelines; coordinate project activities with ranching operations
Road failure/traffic	Insignificant - existing interstate and county roads would accommodate additional traffic; some roads may become temporally impassable due to increased traffic coupled with adverse weather conditions	Same as Proposed Action	Same as Proposed Action	No impact above existing allowable levels; potentially increased from those of Proposed Action and Alternatives A and B due to the absence of coordinated transportation planning efforts	Adherence to BLM road construction and maintenance protocol

Table 2.6 (Continued)

Impact by Environmental Resource	Post-Applicant-Committed Mitigation Impacts				Mitigation(s)
	Proposed Action	**Alternative A**	**Alternative B**	**No Action**	
			LAND USE (Continued)		
Displacement of rural residents	Significant - if increased human activity, visual impacts, noise, and odor displaces rural residents	Insignificant - reduced from Proposed Action; surface disturbance limitations applied in SRAs which include rural residents; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Significant - reduced from Proposed Action but increased from Alternative A; surface disturbance limitations applied in SRAs which include rural residents; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; potentially increased from those of Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts	BLM consultation with community and county governments/organizations to obtain input and to advise regarding the protection of public health and safety in and proximal to rural residential areas
Changes in character and recreational uses of the area due to construction, presence of facilities, noise, dust, odor, and increased human activities	Insignificant - dependent on recreational use; no developed recreation areas occur on area (LOP); some users may be displaced	Insignificant - reduced from Proposed Action; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; potentially increased from those of Proposed Action and Alternatives A and B due to the absence of coordinated reclamation, transportation, and wildlife protection planning efforts	Appropriate road maintenance; use of equipment mufflers; minimize disturbance areas; appropriate and timely reclamation; employee education
Infringement on prior rights	Insignificant (LOP) - no change in designated land uses	Insignificant - reduced from Proposed Action; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; could increase from those of Proposed Action and Alternatives A and B due to the absence of coordinated reclamation, transportation, and wildlife protection planning efforts; disturbance 24,800 acres initially and 18,300 acres LOP	Avoidance of existing ROWs where possible; appropriate construction at ROW crossings; timely revegetation; restriction of development activities on federally managed sections proximal to area residents; coordination of proposed activities with other CD/WIIPA land users

Table 2.6 (Continued)

Impact by Environmental Resource	**Post-Applicant-Committed Mitigation Impacts**				
	Proposed Action	**Alternative A**	**Alternative B**	**No Action**	**Mitigation(s)**
			VISUAL RESOURCES		
Modification in the basic elements (form, line, color, or texture) of visual resources by presence of facilities and equipment	Significant in VRM Class II areas (LOP, 470 acres initial, 174 acres LOP and until areas reclaimed); insignificant in VRM Class III and IV areas (8,126-acre LOP disturbance)	Insignificant - reduced from Proposed Action; surface disturbance limitations applied on federal lands in SRAs which include VRM Class II areas; impacts could be greater on nonfederal lands and on federal lands outside SRAs	Insignificant - reduced from Proposed Action but increased from Alternative A; surface disturbance limitations applied on federal lands in SRAs which include VRM Class II areas; impacts could be greater on nonfederal lands and on federal lands outside SRAs	No impact above existing allowable levels; could increase from those of Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts	Structures painted with standard environmental colors and located to blend with surrounding landscape; appropriate and timely reclamation and revegetation
			HAZARDOUS MATERIALS		
Soil, surface water, and ground water contamination and wildlife exposure	Insignificant (LOP)	Insignificant - same as Proposed Action	Insignificant - same as Proposed Action	No impact above existing allowable levels	Adherence to spill prevention and control countermeasure plans; reserve, production, and/or evaporation pit lining, netting, and fencing, as appropriate; appropriate monitoring, containment, and disposal of potentially hazardous materials

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3.0 AFFECTED ENVIRONMENT

This chapter describes the existing conditions of the physical, biological, cultural, socioeconomic, and visual resources of the CD/WIIPA. The resources addressed were identified during the scoping process and/or IDT review as having the potential to be affected by project-related activities.

Critical elements of the human environment (BLM 1988a), their status in the CD/WIIPA, and their potential to be affected by the proposed project are listed in Table 3.1. Three critical elements (areas of critical environmental concern [ACEC], prime and unique farmland, and wild and scenic rivers) are not present in the CD/WIIPA and would not be affected; therefore, they are not addressed further. In addition to the critical elements, this EIS discusses topography/physiography, mineral resources, geology and geologic hazards, paleontological resources, soils, noise and odor, biological resources, socioeconomics, land use (including livestock/grazing management and recreation), and visual resources.

3.1 PHYSICAL RESOURCES

3.1.1 Climate

3.1.1.1 Temperature and Precipitation

The CD/WIIPA is located in a semiarid (dry and cold), midcontinental climate regime. The area is typified by dry windy conditions, with limited rainfall and long cold winters. The nearest complete meteorological measurements located within the CD/WIIPA were collected at Wamsutter, Wyoming (1948-1997), at an elevation of 6,740 ft and at the Rock Springs Airport (1948-1997) located approximately 40 mi west of the CD/WIIPA at an elevation of 6,741 ft (U.S. Department of Commerce [USDC] n.d.). Because of the variation in elevation and topography within the CD/WIIPA, site-specific climatic conditions will vary.

The CD/WIIPA is typically cool, with average daily temperatures (in degrees Fahrenheit [°F]) ranging between 10°F and 30°F in midwinter and between 50°F and 85°F in midsummer. Extreme temperatures have ranged from -40°F (1979) to 97°F (1954), both occurring at the Rock Springs Airport. The frost-free period (at 32°F) generally occurs from mid-May to early October.

The annual average total precipitation is from 6 to 9 inches, with annual extremes ranging between 3.8 inches (at Wamsutter in 1979) and 14.5 inches (at Rock Springs Airport in 1965). Precipitation is evenly distributed throughout the year, with a minor peak in May. Average annual snow fall is greater in Rock Springs (43.7 inches) than further east at Wamsutter (21.4 inches), with extreme observations ranging from 2.0 inches (at Wamsutter in 1997) to nearly 80 inches (at Rock Springs Airport in 1978). Table 3.2 shows the average monthly temperature ranges and total precipitation amounts.

3.1.1.2 Winds

The CD/WIIPA is subject to strong and gusty winds, often accompanied by snow during the winter months, producing blizzard conditions and drifting snow. The closest comprehensive wind measurements used to describe the wind flow patterns in the region were collected at the Rock Springs Airport. Figure 3.1 shows the relative frequency of winds measured at the Rock Spring Airport (in 1995), with radial distributions by speed class, indicating the direction of the wind source. Tables 3.3 and 3.4 provide the wind speed and wind direction distributions in a tabular format. From this information, it is evident that the annual mean wind speed is nearly 11 mph and the winds originate from the west to southwest nearly 60% of the time.

The frequency and strength of the winds affect the dispersion and transport of air pollutants in the CD/WIIPA. Because of the strong winds in the project area, the potential for atmospheric dispersion is relatively high (although nighttime cooling will enhance stable air, inhibiting air pollutant mixing and transport). Table 3.5 shows the frequency distribution of atmospheric stability classes, which are indicators of atmospheric turbulence, directly affecting air pollutant dispersion. The stability classes are divided into six categories, designated "A" (unstable) through "F" (very stable). The "D" (neutral) stability class occurred more than half of the time in the CD/WIIPA during 1995.

Table 3.1 Critical Elements of the Human Environment, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Element[1]	Status on the CD/WIIPA	Addressed in Text of EIS
Air Quality	Potentially affected	Yes
Areas of critical environmental concern	None present	No
Cultural resources	Potentially affected	Yes
Environmental justice	No effects anticipated	Yes
Farmlands, prime or unique	None present	No
Floodplains	Potentially affected	Yes
Native American religious concerns	No effects anticipated	Yes
Threatened and endangered species	No effects anticipated	Yes
Wastes, hazardous or solid	Potentially affected	Yes
Water quality	Potentially affected	Yes
Wetlands/riparian zones	Potentially affected	Yes
Wild and scenic rivers	None present	No
Wilderness	None present	Yes

[1] As listed in BLM *National Environmental Policy Act Handbook H-1790-1* (BLM 1988a) and subsequent Executive Orders.

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Table 3.2 **Mean Monthly Temperature Ranges and Total Precipitation Amounts, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.**[1]

Month	Average Temperature Range (°F)	Total Precipitation (inches)	Total Snowfall (inches)
Wamsutter, Wyoming (1948-1997)			
January	7 - 27	0.24	4.4
February	10 - 32	0.23	3.3
March	18 - 41	0.33	3.2
April	26 - 54	0.63	2.7
May	34 - 64	1.04	0.5
June	42 - 76	0.77	0.0
July	49 - 84	0.81	0.0
August	47 - 81	0.80	0.0
September	38 - 72	0.75	0.1
October	29 - 59	0.60	1.3
November	17 - 41	0.36	3.2
December	10 - 30	0.24	3.4
Annual (Mean)	41.3	6.48	21.4
Rock Springs Airport (1948-1997)			
January	11 - 29	0.57	7.1
February	14 - 34	0.53	5.8
March	21 - 41	0.71	7.1
April	29 - 53	0.96	5.9
May	37 - 64	1.24	2.1
June	46 - 74	0.88	0.1
July	53 - 83	0.75	0.0
August	51 - 81	0.62	0.0
September	42 - 71	0.76	0.7
October	32 - 57	0.82	4.1
November	20 - 40	0.62	6.0
December	13 - 31	0.57	6.4
Annual (Mean)	42.6	8.91	43.7

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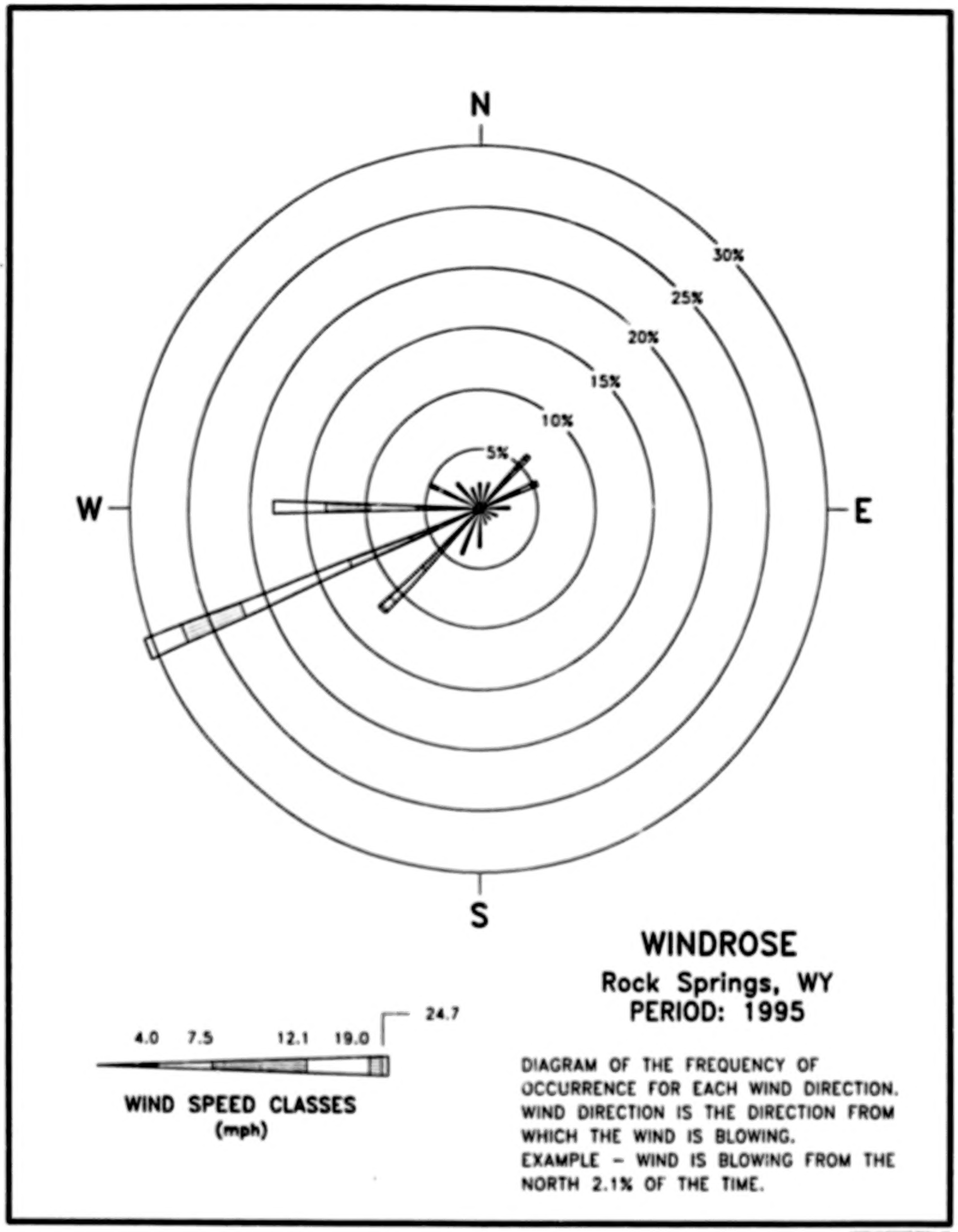
[1] Source: USDC (n.d.).



WINDROSE
Rock Springs, WY
PERIOD: 1995

DIAGRAM OF THE FREQUENCY OF OCCURRENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 2.1% OF THE TIME.

Figure 3.1 Wind Rose for Rock Springs, Wyoming, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Table 3.3 Wind Speed Distribution for Rock Springs, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Wind Speed (mph)	Frequency (percent)
0.0 - 4.0	15.8
4.0 - 7.5	14.6
7.5 - 12.1	22.3
12.1 - 19.0	24.5
19.0 - 24.7	13.2
>24.7	9.6

Table 3.4 Wind Direction Frequency for Rock Springs, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Wind Direction	Frequency (percent)
N	2.1
NNE	2.2
NE	6.1
ENE	5.5
E	2.7
ESE	1.6
SE	1.3
SSE	1.3
S	3.2
SSW	4.0
SW	11.8
WSW	30.7
W	18.0
WNW	4.9
NW	2.9
NNW	1.8

Table 3.5 Atmospheric Stability Class Frequency Distribution for Rock Springs, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Stability Class	Percent Occurrence
A	5.1
B	5.6
C	9.5
D	63.2
E	11.0
F	5.6

Since no impacts to climate are anticipated from this project, climate is not discussed further.

3.1.2 Air Quality

Although specific air quality monitoring is not conducted throughout most of the CD/WIIPA, air quality conditions are likely to be very good, as characterized by limited air pollution emission sources (few industrial facilities and residential emissions in the relatively small communities and isolated ranches) and good atmospheric dispersion conditions, resulting in relatively low air pollutant concentrations.

WAAQS, NAAQS, and Colorado Ambient Air Quality Standards set absolute upper limits for specific air pollutant concentrations at all locations where the public has access. Although the EPA recently revised both the ozone and particulate matter less than 2.5 microns in effective diameter ($PM_{2.5}$) NAAQs, these revised limits will not be applicable until formally approved in the Colorado and Wyoming State Implementation Plans.

The New Source Review - Prevention of Significant Deterioration (PSD) Program is designed to limit the incremental increase of specific air pollutant concentrations above a legally defined baseline level (depending on the location's classification). Four PSD Class I areas were identified by the USFS as sensitive areas within the cumulative impact assessment area (including the Bridger, Fitzpatrick, Mount Zirkel, and Rawah Wilderness Areas). Limitations on the additional amount of air pollution allowed from major emitting facilities in these PSD Class I Areas are very strict. The remainder of the cumulative impact assessment area is classified as PSD Class II, including the Popo Agie and Savage Run Wilderness Areas, Dinosaur National Monument, and the Wind River Roadless Area (administered by the Wind River Environmental Commission), where similar but less stringent incremental air quality limits apply (Map 3.1).

All NEPA analysis comparisons to the PSD Class I and II increments are intended to evaluate a "threshold of concern," and do not represent a regulatory PSD Increment Consumption Analysis. The determination of PSD increment consumption is an air quality regulatory agency responsibility (with EPA oversight). Such an analysis would be conducted as part of a major New Source Review, including a Federal Land Management Agency's evaluation of potential impacts to Air Quality Related Values (AQRV) such as visibility, aquatic ecosystems, flora, fauna, etc. A PSD Increment Consumption Analysis may also be performed by the responsible air quality regulatory agency (or by EPA) in order to determine minor source increment consumption.

While no criteria air pollutant concentration monitoring has occurred in the CD/WIIPA,

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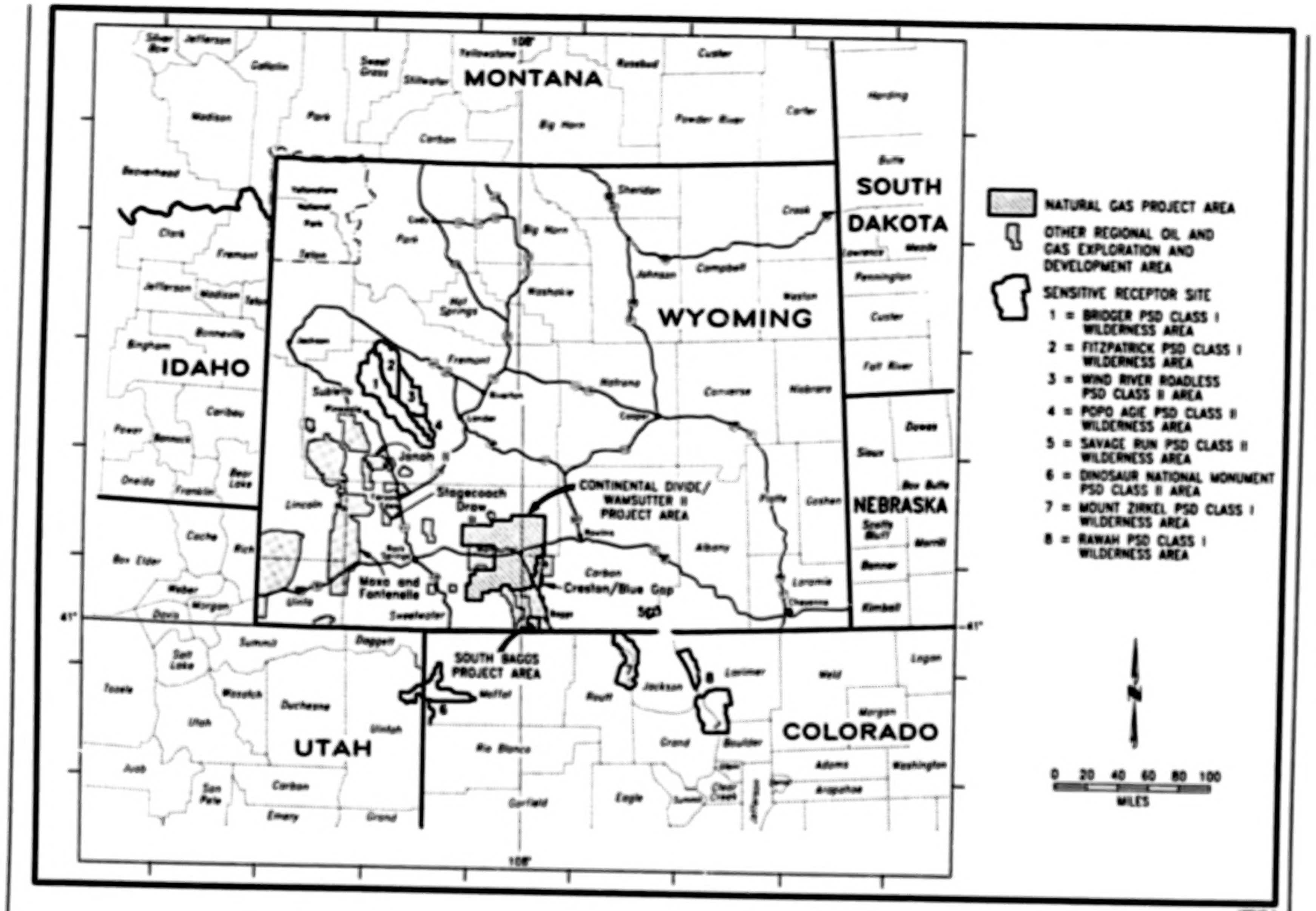
MONTANA
WYOMING
IDAHO
SOUTH DAKOTA
NEBRASKA
UTAH
COLORADO
108°
41°
Jonah II
Stagecoach Draw
CONTINENTAL DIVIDE/ WAMSUTTER II PROJECT AREA
Moxa and Fontenelle
Creston/Blue Gap
SOUTH BAGGS PROJECT AREA
NATURAL GAS PROJECT AREA
OTHER REGIONAL OIL AND GAS EXPLORATION AND DEVELOPMENT AREA
SENSITIVE RECEPTOR SITE
1 = BRIDGER PSD CLASS I WILDERNESS AREA
2 = FITZPATRICK PSD CLASS I WILDERNESS AREA
3 = WIND RIVER ROADLESS PSD CLASS II AREA
4 = POPO AGIE PSD CLASS II WILDERNESS AREA
5 = SAVAGE RUN PSD CLASS II WILDERNESS AREA
6 = DINOSAUR NATIONAL MONUMENT PSD CLASS II AREA
7 = MOUNT ZIRKEL PSD CLASS I WILDERNESS AREA
8 = RAWAH PSD CLASS I WILDERNESS AREA
N
0 20 40 60 80 100
MILES

Map 3.1 Cumulative Air Quality Impact Assessment Area Including Regional PSD Class I and II Sensitive Areas, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

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background values measured in the region are well below established standards. Measured air pollutants include: carbon monoxide (CO), nitrogen dioxide (NO_2), ozone, particulate matter less than 10 microns in effective diameter (PM_{10}), total suspended particulate matter (TSP), and sulfur dioxide (SO_2). Assumed background air pollutant concentrations; applicable NAAQS, WAAQS, and Colorado Ambient Air Quality Standards; and PSD Class I and II increments (measured in micrograms per cubic meter [$\mu g/m^3$]) are provided in Table 3.6. The background concentration data were provided by the Colorado Department of Public Health and Environment, Air Pollution Control Division (CDPHE-APCD) (1996), and the WDEQ (1997), collected primarily at an area outside Craig, Colorado, and at other sites in northwest Colorado and in Sweetwater County, Wyoming. These values reflect the most recently available air quality monitoring data collected in the vicinity of the CD/WIIPA. An estimate of background air quality concentrations is needed to combine with modeled project-related air quality impacts and to compare the total predicted impacts with applicable air quality standards. It is important that each pollutant's background concentration, model predictions, and air quality standards are all based on the same averaging times.

Continuous visibility-related optical background data were collected at the PSD Class I Bridger Wilderness Area in Wyoming and the PSD Class I Rocky Mountain National Park (just south of the PSD Class I Rawah Wilderness Area) in Colorado, as part of the Interagency Monitoring of PROtected Visual Environments (IMPROVE) program. Visibility in the Central Rocky Mountains is very good (averaging over 70 mi Standard Visual Range), with fine particle impacts accounting for nearly half of the average degradation (Sisler 1996). In addition, background atmospheric deposition (acid rain) impacts were monitored at the National Acid Deposition Program/National Trends Network sampling station near Pinedale, Wyoming, and site-specific lake chemistry (Ph, acid neutralizing capacity, elemental concentrations, etc.) background data have been collected by the U.S. Geological Survey (USGS) (Water Quality Division) in several high mountain lakes in the nearby wilderness areas.

The WDEQ-AQD is the primary air quality regulatory agency responsible (under their EPA-approved State Implementation Plan) for determining potential impacts once detailed development plans have been made, subject to applicable air quality laws, regulations, standards, control measures, and management practices. Therefore, the State of Wyoming has the ultimate responsibility for reviewing and permitting CD/WIIPA air pollutant emission sources before they become operational. Unlike the conceptual "reasonable, but conservative" engineering designs used in this NEPA analysis, the WDEQ-AQD air quality preconstruction permitting would be based on site-specific detailed engineering values available as part of the permit application.

3.1.3 Topography and Physiography

The northern portion of the CD/WIIPA lies within the Great Divide Basin and the southern portion is in the Washakie Basin (Hettinger et al. 1991) (Map 3.2). The area is centrally divided by the Wamsutter Arch, a structural high running east and west that separates the Washakie and Great Divide Basins.

Topographically, the CD/WIIPA is generally broken country comprised of badlands, buttes, rims, flats, and basins. The northwest portion is comprised largely of the Red Desert Basin, whereas the northeast portion includes several depression lakes (playas) in the Chain Lakes area (see Map 3.2). The CD/WIIPA is centrally divided north and south by the Delaney Rim, which follows the Continental Divide for approximately 30 mi at an elevation of approximately 7,200 ft. Elevations in the CD/WIIPA range from approximately 7,500 ft in The Haystacks in the southeast to approximately 6,500 ft in the Chain Lakes area in the northeast.

The Antelope Creek/Bitter Creek drainage is the only perennial stream within the CD/WIIPA. All other waterways are ephemeral, flowing in response to spring snowmelt and runoff from storm events. Drainage patterns are separated north and south by the Continental Divide. Drainage north of the Continental Divide is to the Great Divide Basin, whereas south of the divide drainage is to the Green River via Antelope and Bitter Creek or to the Little Snake River via Shell Creek, Sand Creek, and Barrel Springs Draws. The Little Snake River is a tributary of the Green River, which in turn is a tributary of the Colorado River.

Table 3.6 Representative Pollutant Background Concentrations, State and National Ambient Air Quality Standards and PSD Increments ($\mu g/m^3$), Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Pollutant/Averaging Time	Measured Background Concentration	State and National Ambient Air Quality Standards[1]	Incremental Increase Above Legal Baseline	
			PSD Class I	PSD Class II
Carbon monoxide (CO)				
1-hr	2,299[2]	40,000	n/a[3]	n/a
8-hr	1,148[2]	10,000	n/a	n/a
Nitrogen dioxide (NO_2)				
Annual	10[4]	100	2.5	25
Ozone[5]				
1-hr (national)	117[6]	235	n/a	n/a
1-hr (Wyoming)	117[6]	160	n/a	n/a
Particulate matter (PM_{10})				
24-hr	20[6]	150	8	30
Annual	12[6]	50	4	17
Particulate matter (TSP)				
24-hr (Wyoming)	45[7]	150	n/a	n/a
Sulfur dioxide (SO_2)				
3-hr (National)	29[8]	1,300	25	512
3-hr (Colorado)	29[8]	695	n/a	n/a
24-hr (National)	18[8]	365	5	91
24-hr (Wyoming)	18[8]	260	n/a	n/a
Annual (National)	5[8]	80	2	20
Annual (Wyoming)	5[8]	60	n/a	n/a

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[1] Source: WESTAR (1995).

[2] Data collected at Rifle and Mack, Colorado, in conjunction with proposed oil shale development during the early 1980s (CDPHE-APCD 1996).

[3] n/a = not applicable.

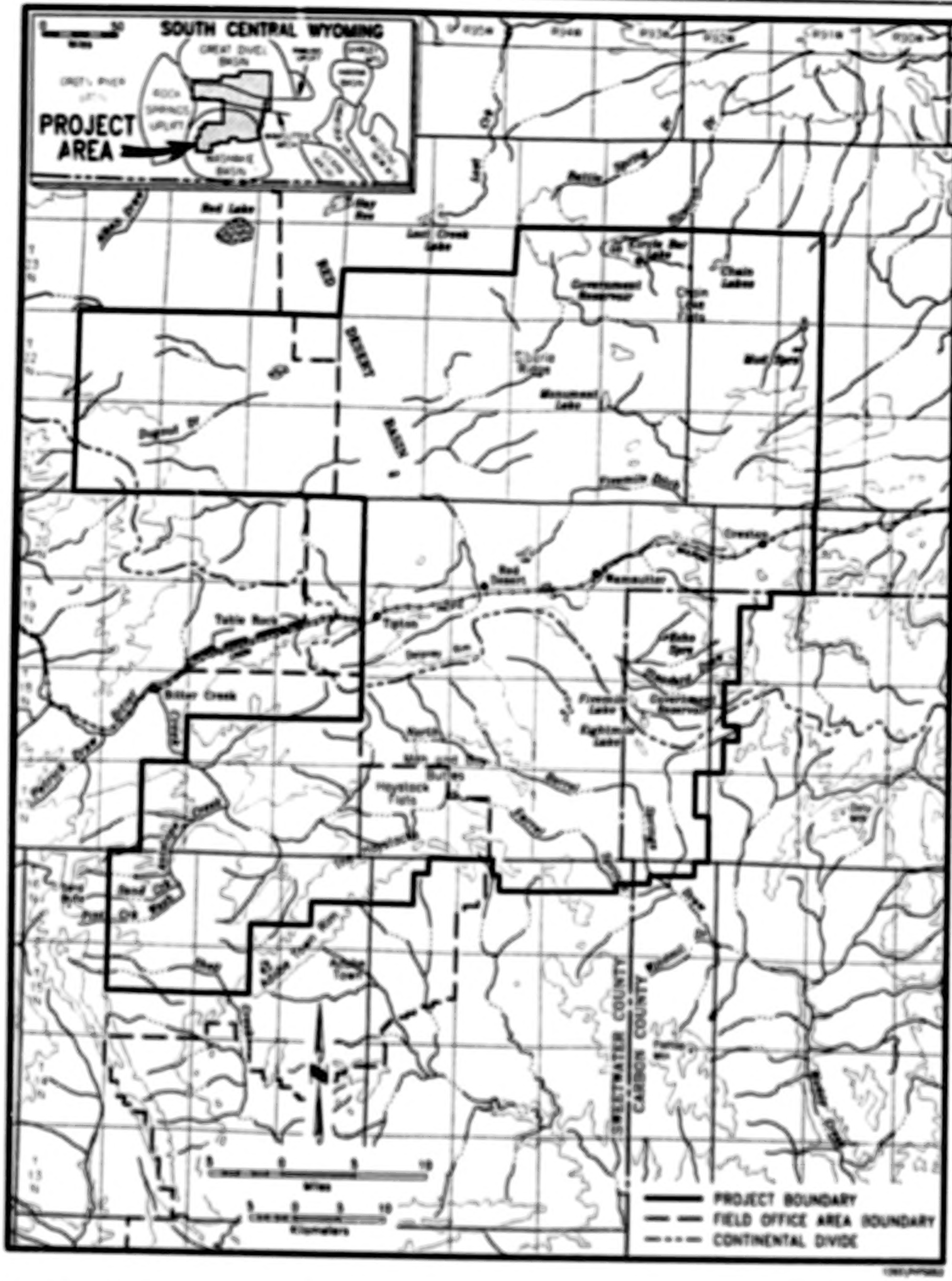
[4] To supplement monitored NO_2 data, a separate NO_2 modeling analysis was performed, including many oxides of nitrogen (NO_x) emission sources (BLM 1996c).

[5] Measured background ozone concentration data is top tenth percentile maximum 1-hr value during July; other short-term background concentrations are second-maximum measured values.

[6] Data collected at UCG Project, 9 mi west of Rawlins, Wyoming, June 1994 - November 1994 (WDEQ 1997).

[7] Data collected at Chevron Chemical Company Phosphate Project, 4.5 mi southeast of Rock Springs, Wyoming, 1984 (Coté 1984).

[8] Data collected at Craig Power Plant site and at Colorado oil shale areas (CDPHE-APCD 1996).



Map 3.2 Topography and Physiography, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

3.1.4 Geology

The surficial geology of the CD/WIIPA is primarily composed of deposits of Tertiary and Quaternary sedimentary rocks (Love and Christiansen 1985) (Map 3.3). The predominant Tertiary surficial rocks are from the Washakie, Green River, Wasatch, and Battle Spring Formations. Quaternary deposits (playa lake, lacustrine, gravel, pediment, fan, dune sand, and loess deposits) include alluvium (sediment) and aeolian (windblown) materials. Quaternary deposits of alluvium, sand, and gravel occur primarily along the floodplains of Antelope Creek, in the Red Desert Basin, and in the Chain Lakes area (see Maps 3.2 and 3.3). Windblown deposits, including sand dunes, occur throughout the CD/WIIPA, especially in the Red Desert Basin (see Section 3.1.5.2).

The stratigraphy of the Washakie and Great Divide Basins is generally composed of thick layers of irregularly shaped sedimentary rocks that vary in thickness and change considerably from north to south (Hettinger et al. 1991). The sequence of sediments underlying the CD/WIIPA is greater than 20,000 ft thick and ranges in age from Cambrian to Tertiary (Post 1955). The general stratigraphy underlying the CD/WIIPA to a depth of approximately 11,000 ft is provided in Figure 2.3, Wellbore Diagrams.

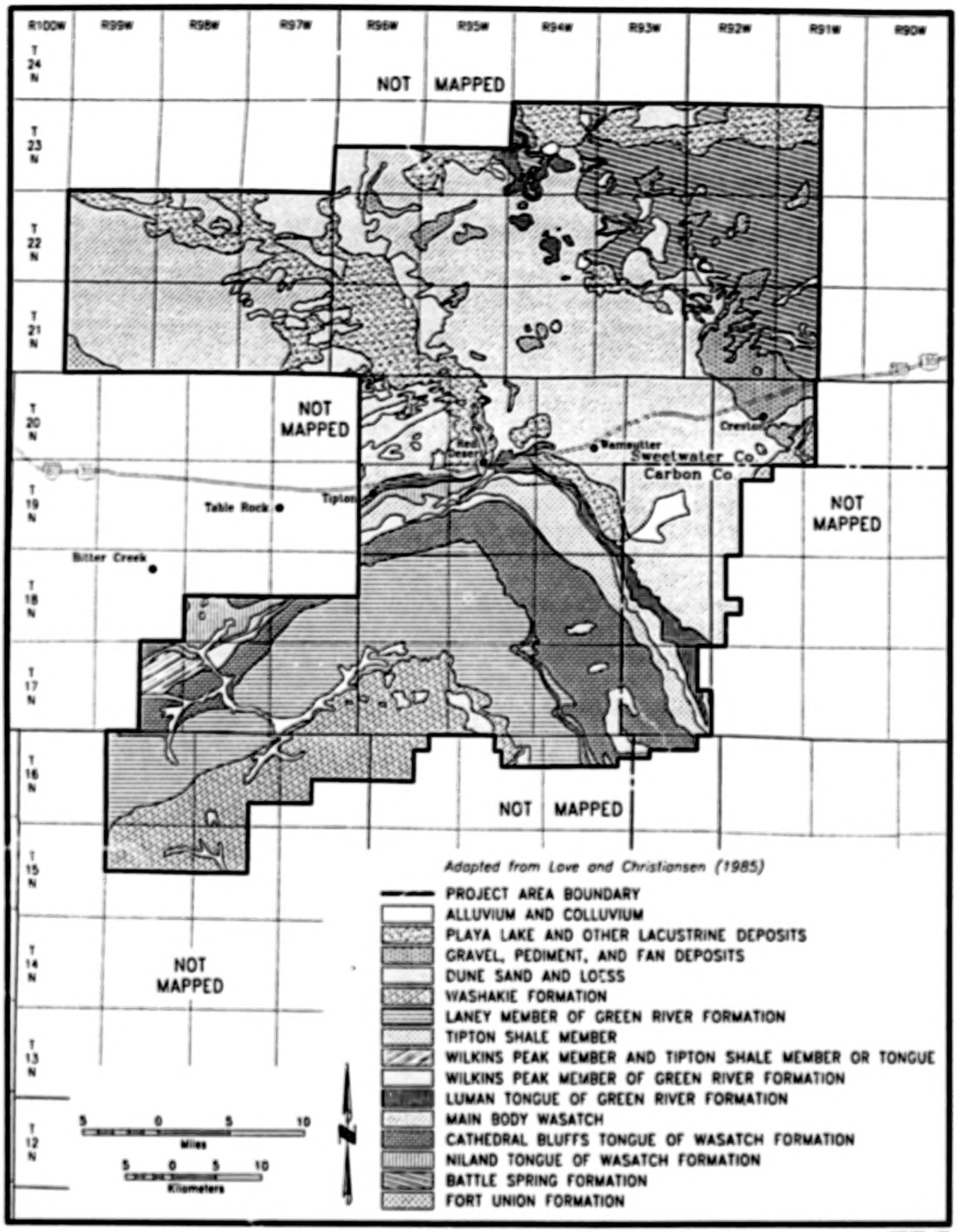
3.1.4.1 Mineral Resources

Oil and Gas. Oil and gas fields were first discovered in the CD/WIIPA in 1946 (Table 3.7) (WOGCC 1995). In 1995, there were 764 producing wells on and within 6 mi of the CD/WIIPA (i.e., within townships included in the CD/WIIPA), and these 764 wells produced 114,365 mmcf of gas and approximately 1.5 million bbls of oil (mbo). Cumulative production from the area through 1995 was 1,948,676 mmcf of gas and approximately 91.2 mbo. Of the 845 wells within the CD/WIIPA, approximately 631 wells have been completed for production and 488 of these wells are currently active producers. Most oil and gas fields in the area produce from the Mesaverde Group; however, other formations including the Lance, Lewis, Frontier, and Steele Shale have produced some oil and gas (BLM 1994a; personal communication, February 1996 and June 1997, with Fred Crockett, BLM Reservoir Management Group). Coalbed gas may also be an important future source of natural gas in the CD/WIIPA (Tyler et al. 1997).

Current oil and gas production in the CD/WIIPA is approximately 1.3 mbo and approximately 102,000 mmcf of gas per year (PI/Dwights 1998). The Almond Formation of the Mesaverde Group and Lewis Shale produce about 97% of the gas and producing depths range from 2,100 ft (Lance Formation) at the Bitter Creek field (T16N, R99W) to 20,600 ft (Lakota Formation) at the Ten Mile Draw field (T21N, R99W). Eighty-eight percent of the producing wells have depths ranging from 8,300 to 12,500 ft.

All geologic formations with recorded production from the CD/WIIPA are described below and shown in Figure 3.2. Proposed development areas as identified by Operators are shown on Map 3.4.

- Almond Formation (upper Cretaceous Mesaverde Group). Approximately 89% of annual (May 1997 - June 1998) gas production is from the Almond Formation. The Almond Formation ranges in depth from 6,000 to 17,000 ft in the CD/WIIPA, and most gas production is from depths of 8,000-12,000 ft. The Almond Formation consists of two types of hydrocarbon reservoirs. The Almond marine bar sandstone occurs at the top of the Almond Formation and has good lateral continuity and reservoir quality. Average thickness in currently producing fields is about 25 ft. Estimated maximum drilling density is one well per 160-320 acres in most areas where the Almond marine bar sandstone is developed. However, in a few areas, drilling density may be as high as one well per 80 acres. The Almond marine bar sandstone is not present over most of the project area. The main Almond sandstone underlies the Almond marine bar sandstone, and reservoirs are laterally discontinuous, vertically stacked, fluvial, and estuarine sandstones, perhaps averaging less than 60 acres in extent. The net thickness of gas productive sandstones ranges from 10 to 100 ft (Henry and Logan 1992), and the average drainage area, based on Wyoming BLM Reservoir Management Group drainage investigations, is 70 acres. Estimated maximum drilling density is one



Map 3.3 Surficial Geology, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Table 3.7 Gas and Oil Production from Fields Located in and Adjacent to (Within 6 mi) the CD/WIIPA, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.[1]

Field Name	Discovered	Number of Producing Wells (1995)	1995[2]		Cumulative	
			Gas (mmcf)	Oil (bbls)	Gas (mmcf)	Oil (mbo)[3]
Antelope	1970	5	514	113	32,471	0.03
Arch	1959	12	574	29,731	88,137	18.60
Barrel Spring	1965	67	5,826	56,114	48,563	0.55
Blue Gap	1974	34	973	6,396	21,762	0.21
Cherokee Creek	1960	5	29	2,932	2,962	0.44
Coal Gulch	1977	18	3,373	38,915	43,467	0.83
Creston	1960	7	630	7,600	7,312	0.11
Delaney Rim	1976	8	248	20,564	6,852	1.03
Desert Springs West	1959	9	139	17,759	34,827	1.50
Echo Springs	1977	95	22,302	289,378	264,717	5.99
Fillmore	1976	6	34	3,195	1,567	0.11
Great Divide	1978	6	689	18,798	5,791	0.28
Higgins	1969	9	1,518	648	81,911	0.06
Mulligan Draw	1990	7	1,703	6,336	7,544	0.04
Patrick Draw	1959	36	2,030	76,810	165,019	42.88
Red Desert	1971	4	64	1,615	1,173	0.05
Siberia Ridge	1975	42	2,802	46,620	24,703	0.26
Stage Stop	1966	9	182	12,857	11,458	0.89
Standard Draw	1978	66	20,978	250,182	196,500	4.62
Table Rock	1946	100	15,597	151,309	538,688	5.73
Tierney	1973	11	493	18,662	10,030	0.42
Wamsutter	1958	84	11,552	118,954	114,444	1.10
Wild Rose	1975	71	18,051	219,272	135,257	3.68
Others[4]	1946-1995	53	4,064	107,661	103,521	1.76
Total		764	114,365	1,502,421	1,948,676	91.17

[1] Adapted from WOGCC (1995).

[2] mmcf = million cubic feet.
bbls = barrels.

[3] mbo = million barrels of oil.

[4] Includes the Adobe Town, Alkaline Creek, Battle Springs, Continental Divide, Cow Creek, Deep Creek, Deep Gulch, Desert Flats, Emigrant Trail, Fairway, Five Mile Gulch, Frewen, Gale, Gap Road, Hansen Draw, Iron Pipe, Laney Wash, Lost Creek, Lost Creek Basin, Monument Lake, Mud Lake, N.T., Neff, Playa, Primitive, Red, Robin, Salazar, Salt Sage Draw, Sand Butte, Sentinel Ridge, Sheep Camp, Shell Creek, Sink Hole, Smokey, Snowbank, Strike, Table Rock Southwest, Ten Mile Draw, Tipton, Two Rim, Wells Bluff, Willow Reservoir, Windmill Draw, and Windy Hill Fields.

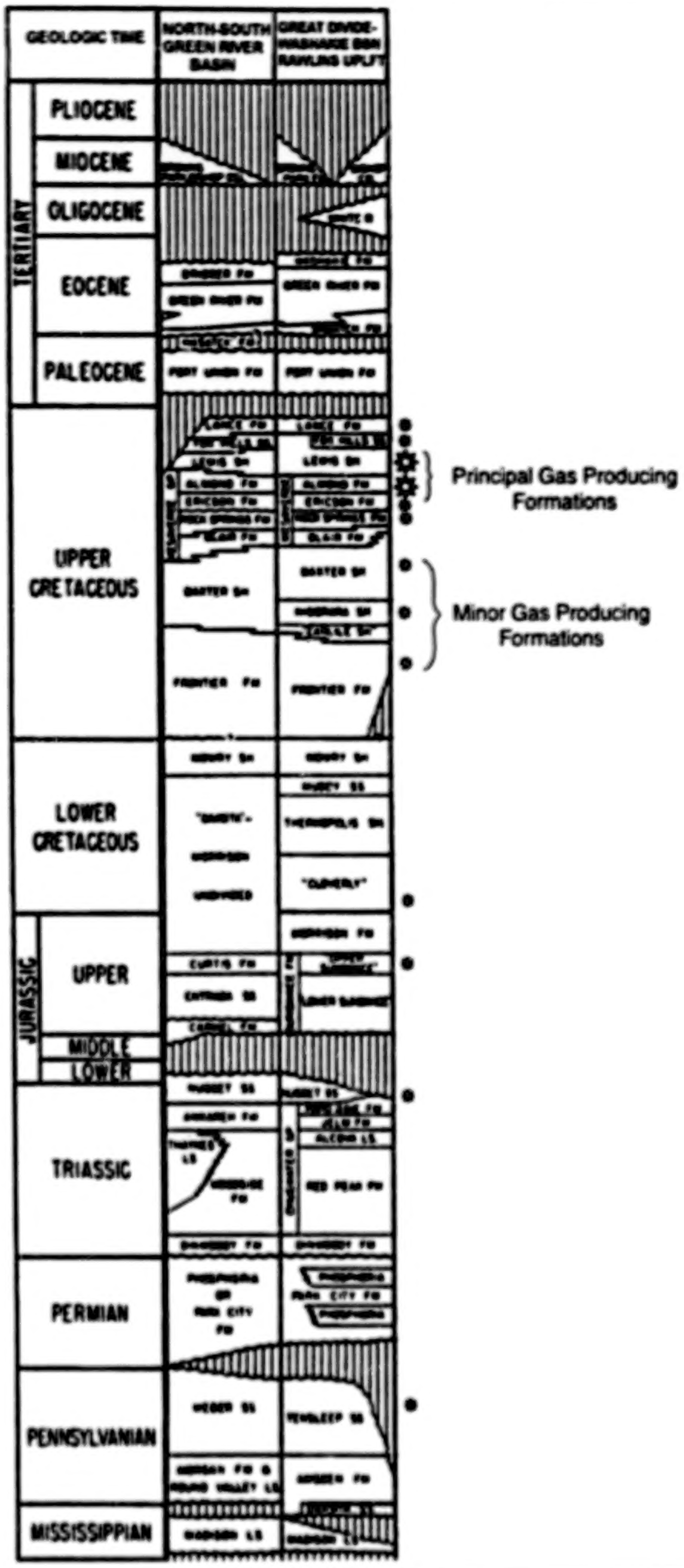


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Figure 3.2 Subsurface Geology of the Continental Divide/Wamsutter II Project Area (Adapted from Wyoming Geological Association 1969) with Producing Formations, Sweetwater and Carbon Counties, Wyoming, 1999.

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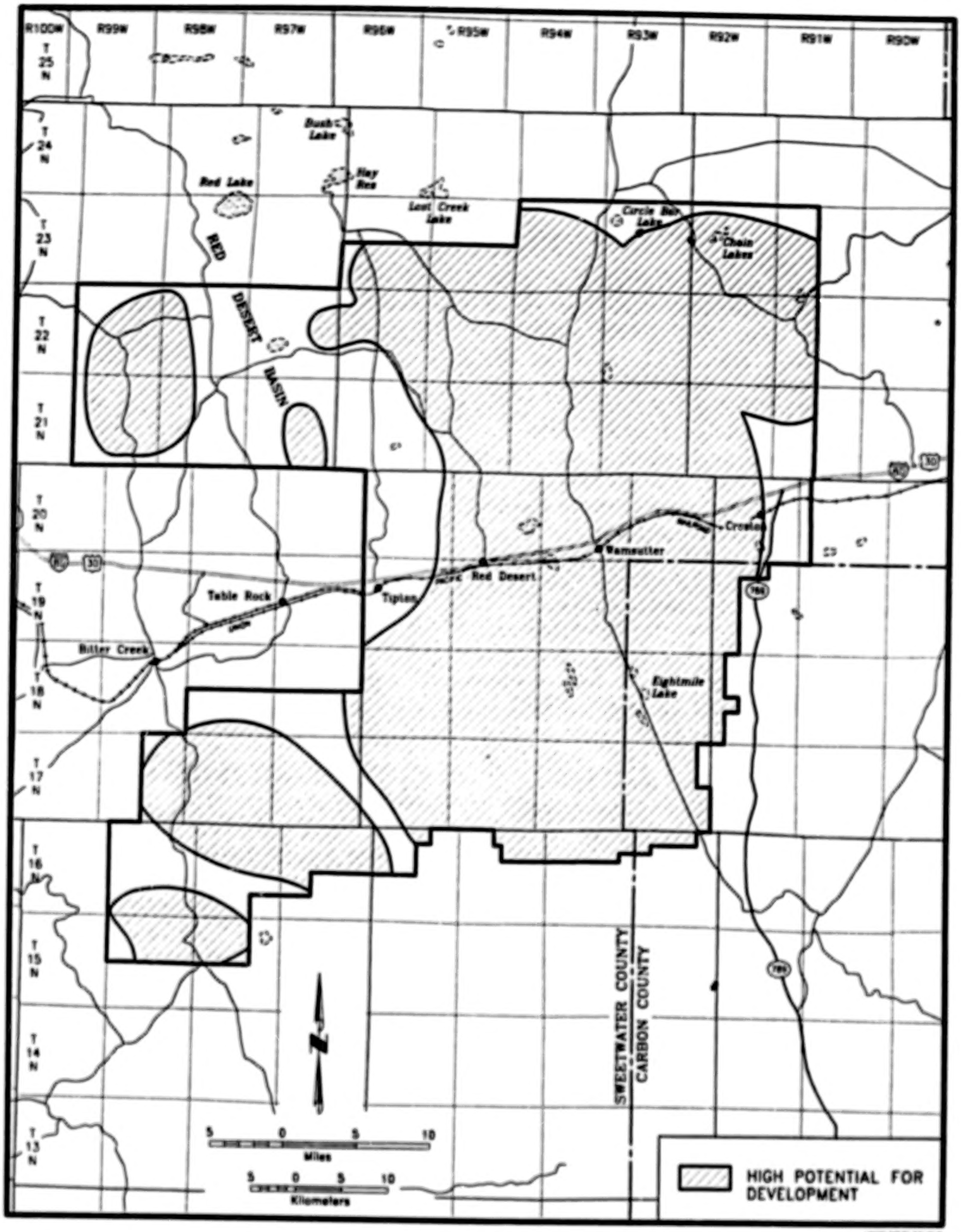

Map 3.4 Areas with a High Potential for Development, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

well per 80-160 acres in most areas where the main Almond sandstone is developed. In a few areas, drilling density may be as high as one well per 40 acres. Most wells in the CD/WIIPA produce from the main Almond sandstone.

- Baxter Shale (upper Cretaceous). Less than 1% of annual (May 1997 - June 1998) gas production (two wells) is from this soft slightly sandy shale.
- Curtis Sandstone (upper Jurassic part of the Sundance Formation). Less than 1% of annual (May 1997 - June 1998) gas production (one well) is from this conglomerate, sandstone, shale, and limestone formation.
- Ericson Formation (upper Cretaceous Mesaverde Group). About 1% of annual (May 1997 - June 1998) gas production is from the Ericson Formation. Gas production from this formation is often commingled (i.e., mixed) with production from the Almond Formation. The Ericson Formation contains massive and thin-bedded sandstones.
- Fox Hills Sandstone (upper Cretaceous). Less than 1% of annual (May 1997 -June 1998) gas production (three wells) is from this sandstone and sandy shale formation.
- Frontier Formation (upper Cretaceous). Less than 1% of annual (May 1997 -June 1998) gas production (one well) is from this sandstone, shale, and local coal formation.
- Lakota Sandstone (basal part of lower Cretaceous Cloverly Group). Less than 1% of annual (May 1997 - June 1998) gas production (four wells) is from this coarse-grained sandstone formation.
- Lance Formation (uppermost Cretaceous). Less than 1% of annual (May 1997 - June 1998) gas production (eight wells) is from this carbonaceous shale and siltstone, with basal sandstone as much as 80 ft thick.
- Lewis Shale (upper Cretaceous). About 8% of annual (May 1997 - June 1998) gas production is from this formation. Reservoirs are continuous deep water marine sandstones encased in marine shale. Net thickness is about 30 ft, and reservoir continuity is generally good with individual reservoirs extending from about 1 to 6 mi. Depth to the top of the Lewis Shale in the area ranges from 4,500 to 15,000 ft. Most Lewis Formation gas production is from about 5,000 to 6,000 ft or 8,000 to 11,000 ft. Estimated maximum well density is one well per 160-320 acres, and in a few areas well density may be as high as one well per 80 acres.
- Niobrara Formation (upper Cretaceous). Less than 1% of annual (May 1997 - June 1998) gas production (one well) is from this shale and marl formation.
- Nugget Sandstone (upper Triassic and lower Jurassic). Less than 1% of annual (May 1997 - June 1998) gas production (six wells) is from this medium- to coarse-grained aeolian sandstone.
- Rock Springs Formation (part of upper Cretaceous Mesaverde Group). Less than 1% of annual (May 1997 - June 1998) gas production (one well) is from this sandstone, alternating with thick coal beds and carbonaceous shale formation.
- Weber Sandstone (Pennsylvanian). Less than 1% of annual (May 1997 - June 1998) gas production (two wells) is from this sandstone with minor interbedded limestone formation. This is stratigraphically the lowest producing formation in the area. Drilling depths to the Weber Sandstone may be as deep as 28,000 ft in the CD/WIIPA.

Coal. The CD/WIIPA lies within the Red Desert and the Little Snake River Known Recoverable Coal Resource Areas (KRCRAs). There are no known active coal leases within the CD/WIIPA, and the potential for future coal mining is slight due to market conditions (personal communication, May 1995, with Brenda Vosika and Ted Murphy, BLM, Minerals Specialists). However, the area is underlain by coal-bearing strata at the surface in the Wasatch Formation and in the subsurface with Paleocene and Cretaceous strata (Jones 1991). Areas within the CD/WIIPA have been leased for coal in the past; however, the last of these leases expired in 1986.

Oil Shale. The Laney Member and other members of the Green River Formation contain oil shale resources. However, oil shale is not expected to be an economically important mineral in the CD/WIIPA in the foreseeable future (BLM 1992). No oil shale leases exist within CD/WIIPA (personal

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communication, May 1995, with Brenda Vosika and Ted Murphy, BLM, Minerals Specialists).

Locatable Minerals. Uranium prospecting has occurred in the CD/WIIPA since before the mid-1950s (Groth Minerals Corporation 1977), and there are currently several prospects within or immediately adjacent to the CD/WIIPA. U.S. Energy/Kennecott has over 277 uranium claims within the CD/WIIPA (personal communication, May 1995, with Brenda Vosika, BLM, Minerals Specialist). The northern portions of the CD/WIIPA contain areas of uraniferous coal deposits (Harris et al. 1985), and the USGS estimates that more than 60 million pounds of U_3O_8 are contained in strippable coal in the Eocene Wasatch Formation in concentrations of 0.003% U_3O_8 or greater. However, at this time uranium is not economically recoverable. An inactive mine (Battle Spring Formation) and mill (on stand-by)--the Sweetwater Uranium Mine and Mill--occur approximately 3 mi north of the CD/WIIPA. Weak gold anomalies have been discovered in the southwest portion of the CD/WIIPA and along Delaney Rim (Hausel et al. 1994) (see Map 3.1). No other known locatable minerals occur within the CD/WIIPA in sufficient quantities for economical recovery (BLM 1987a:126).

Salable Minerals. Sand and gravel permits are periodically granted to the WDOT along I-80 and to the public (personal communication, May 1995, with Mark Newman, BLM, Geologist); however, transportation costs restrict any long-term commercial interest in this resource (BLM 1987a:127).

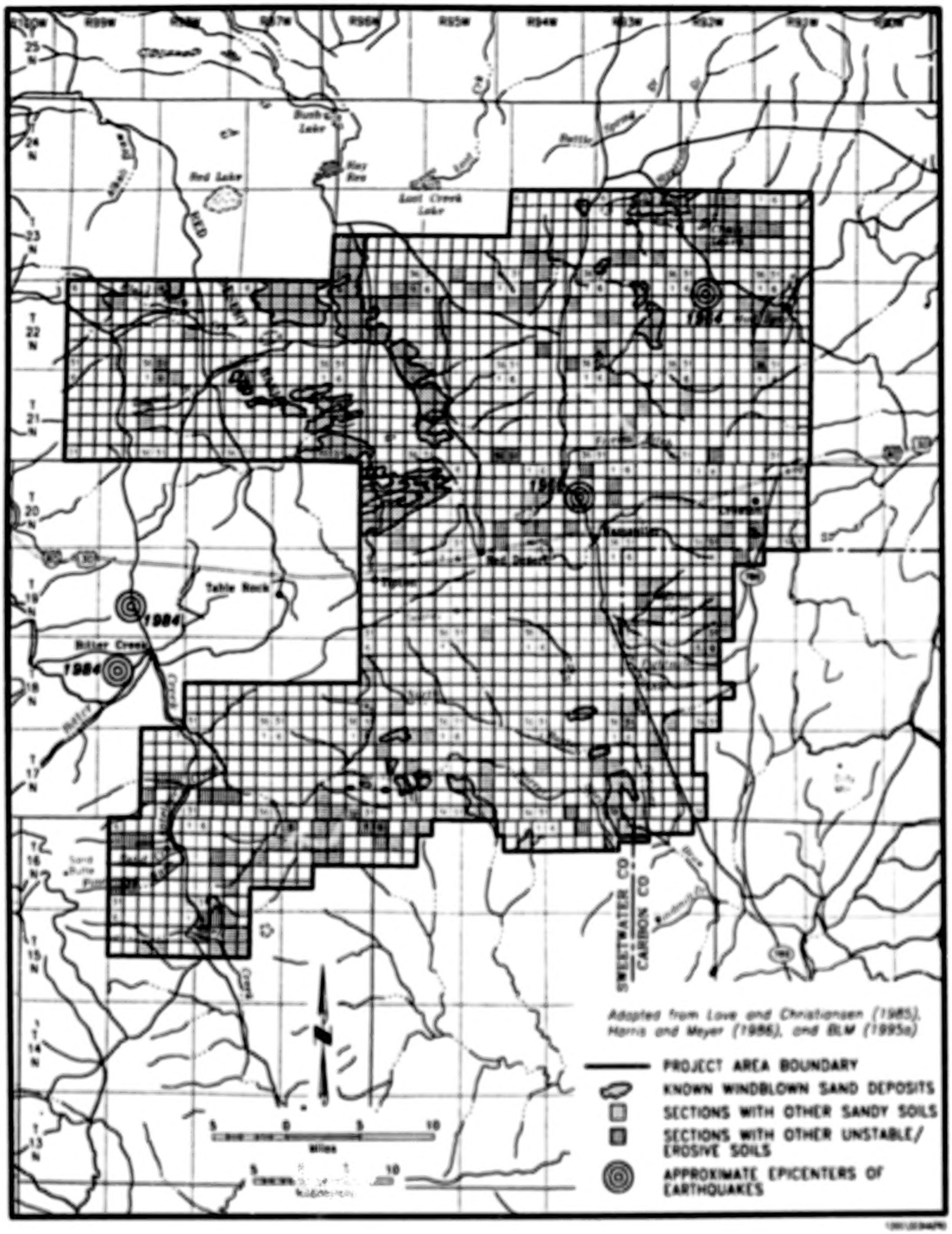
3.1.4.2 Geologic Hazards

The potential for seismic activity within the CD/WIIPA is low to moderate (personal communication, May 1995, with James Case, Wyoming State Geological Survey). The CD/WIIPA is located in a Zone I (low risk) seismic area; however, a known active fault system--the North Granite Mountain/Green Mountain segment--is located approximately 30 mi north of the area. This fault system has a recurrence interval of 2,000-6,000 years and could generate a maximum credible earthquake of magnitude 6.75 (Richter Scale) with an intensity of 7-8 on the Modified Mercalli Scale (personal communication, May 1995, with James Case, Wyoming Geological Survey; Case et al. 1994). In 1966 an earthquake was recorded in the CD/WIIPA approximately 4 mi north of Wamsutter (Map 3.5). In 1964 an earthquake occurred approximately 5 mi northwest of Mud Springs in the northeastern portion of the CD/WIIPA with a magnitude of 4.1 (Richter Scale). Other seismic activity occurred just west of the CD/WIIPA in the 1970s and 1980s, including two earthquakes in 1984 to the southwest and north of Bitter Creek (see Map 3.5).

There are no known abandoned mines in the CD/WIIPA (personal communication, May 1995, with James Case, Wyoming Geological Survey). Therefore, no potential exists for subsidence from abandoned mines.

Large areas of stabilized windblown sand deposits (i.e., dunal areas) occur throughout the CD/WIIPA, especially in the Red Desert Basin area (Harris and Meyer 1986) (see Maps 3.3 and 3.5). These dunal areas comprise approximately 60,800 acres (6%) of the CD/WIIPA and have been identified as SRAs (see Map 2.3). Dunes within the CD/WIIPA have significant amounts of residuum (weathered rock) and are generally stabilized by vegetation. Consequently, dune movement in the area is minor in the absence of surface disturbance (personal communication, May 1995, with James Case, Wyoming Geological Survey).

Additional geologic hazards in the CD/WIIPA include landslides, flooding, and the presence of radioactive material in the subsurface. Detailed mapping of landslides in the CD/WIIPA is incomplete; however, landslides--predominantly multiple block slides and multiple slump flows--do occur along Delaney Rim (personal communication, May 1995, with Laura Larson, Wyoming Geological Survey). The Federal Emergency Management Agency (FEMA) has not published a flood hazard map for the CD/WIIPA (personal communication, May 1995, Mark Kot, Sweetwater County Planning and Zoning); however, the greatest flood hazard probably occurs along the Antelope Creek drainage during spring runoff. Minor flooding may occur along ephemeral streams in response to snowmelt and rainstorms (BLM 1992, 1995a). Some of the coal resources in the northern half of the CD/WIIPA contain uranium (a radioactive element) and have been considered low-grade uranium ores (personal communication, March 1995, Gary B. Glass, State Geologist, Wyoming Geological Survey), and these low-grade uranium ores may be encountered during drilling operations.



Map 3.5 Geologic Hazards, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

3.1.4.3 Paleontological Resources

The important fossil records of the Washakie and Great Divide Basins are well-known (BLM 1987a:106, 1992, 1995a; Breithaupt 1995a, 1995b), and several known paleontological localities occur within the CD/WIIPA. Excellent exposures of Eocene Epoch rocks occur in the CD/WIIPA, and a large and diverse (but incompletely studied) vertebrate fauna is known. Roehler (1972) writes, "Vertebrate fossils are abundant and indicate that nearly all of the provincial ages of the continental Eocene are represented." A fine summary of paleontological investigations in this area of Wyoming dating back to the 1870s is included in Turnbull (1978). The CD/WIIPA is in an area of high paleontological sensitivity, with approximately 90% of the CD/WIIPA having formations with known paleontologic values at or near the ground surface.

The area in and around the CD/WIIPA contains one of the most complete records of continental deposition in North America (Roehler 1972), encompassing exposures of the Fort Union, Battle Springs, Wasatch, Green River, and Washakie Formations. Dr. Henry Roehler of the USGS in Denver has done most of the stratigraphic and sedimentologic work in the Washakie Basin (Roehler 1965, 1969, 1972, 1973a, 1973b, 1992a, 1992b, 1993).

The Washakie Formation is exposed in the southwestern portion of the CD/WIIPA (see Map 3.3) and consists of interbedded mudstones, tuffaceous and arkosic sandstones, tuffs, limestones, conglomerates, shales, and siltstones (Roehler 1972). Fossils of algae and mollusks are found throughout the formation (Roehler 1972), and within the CD/WIIPA, fossils of the Bridgerian and Uintan North American Land Mammal Ages can be found (Wood et al. 1941; Krishtalka et al. 1987).

The lacustrine deposits of the Laney Member of the Green River Formation are known to contain well-preserved fossil fish (Grande 1984) (see Map 3.3). It is believed to contain fossils of the Bridgerian North American Land Mammal Age (Wood et al. 1941; Krishtalka et al. 1987).

The Wasatch Formation consists of three members, the basal member (Main Body) and two overlying tongues (Niland and Cathedral Bluffs tongues), and all members are encountered in the CD/WIIPA (see Map 3.3). Vertebrate fossils are found primarily in the non-red facies of the variegated beds including the sandstones (Roehler 1972) and include fossils of the Wasatchian North American Land Mammal Age (Wood et al. 1941; Krishtalka et al. 1987).

The Battle Spring Formation is exposed in the northeastern part of the CD/WIIPA (see Map 3.3). Although the paleontology of this formation has not been studied in detail, the formation is similar to the Wasatch Formation, which it grades into, and has the potential to contain paleontological resources. Outcrops of the Battle Spring Formation north of the CD/WIIPA contain turtle shell fragments, mollusks, and notable amounts of calcite (Steele 1985; BLM 1995b).

The Fort Union Formation is also exposed in the CD/WIIPA (see Map 3.3). Plant and animal fossils, including fossils of the Torrejonion and Tiffanian North American Land Mammal Ages (Wood et al. 1941), are found throughout the formation.

3.1.5 Soils

3.1.5.1 General Soil Characteristics

Approximately 150 soil mapping units are known to occur in the CD/WIIPA, and these soils vary widely depending on topographic position, parent material, local hydrology, slope, and other factors influencing soil formation processes (BLM 1992, 1995a; BLM and Gary Holsan Environmental Planning [GHEP] 1995a). Additional soils maps for the CD/WIIPA and associated transportation planning area are provided in the TPTSD for this project (BLM 1998a). In general, soils found in the CD/WIIPA were formed under a dry cool climate with spring moisture. These soils generally have low organic matter and are formed from residuum on bedrock-controlled uplands and in alluvium in playas. Soils were formed from the bedrock exposed at the surface (e.g., Green River, Wasatch, Battle Springs, and Fort Union Formations), as well as from lake, wind, and flowing water deposits, and most are medium- to fine-textured, having been derived from marine shales. Soil textures consist primarily of variations of loam (e.g., sandy loam, loam, clay loam, silty clay loam); however, heavier soils (e.g., silty clay or clay textures) occur in bottomlands, basins, and playas, and stratified sands and gravels are present in riverwash associated with streambeds and floodplains. Stabilized intermittent sand dunes are present in hilly upland areas. Badlands and rock outcrops, generally formed from shale and sandstone, have little or no soil development due to their predominant erosive features. Slopes are generally level to undulating (0-10%), but areas of steeper slopes (10-40%) also occur.

Shallow soils (<20 inches) occur throughout most of the CD/WIIPA on plains and ravines underlain by sandstone and shale bedrock, as well as in areas with steeper topography. Deep to moderately deep soils (>60 inches) are present on alluvial fans, basins, valley alluvium, and residual upland plains.

The majority of soils in the CD/WIIPA have moderate permeability; however, sandy areas have moderately rapid to rapid permeability, and soils with heavier textures have moderately slow to slow permeability. Most soils in the CD/WIIPA are likely to form a surface crust, particularly if vegetative cover deteriorates. The average available water-holding capacity of soils in the CD/WIIPA is low to moderate.

Soil productivity is naturally low for most soils in the CD/WIIPA. Precipitation is the chief controlling factor of productivity, and the relatively low precipitation rates produces limited vegetative cover and, consequently, limited organic matter for the soil.

Soil erodibility varies with soil texture, with silts and silt loam being most susceptible to water erosion and fine sands, loamy sands, and coarse sandy loams being most susceptible to wind erosion. Sandy soil areas and areas with other soils having erodibility limitations are shown on Map 3.5. Water erosion primarily occurs during spring snowmelt and summer thunderstorms that cause intensive runoff and flash flooding, and sheet and rill erosion occur simultaneously on upland areas. The sparse vegetative cover on much of the CD/WIIPA exposes soils to raindrop impact, and although soil susceptibility to water erosion is generally slight to moderate, it is severe in areas with low permeability. Runoff potential is medium but ranges from slow to very rapid.

Overall wind erosion potential is moderate, and most of the CD/WIIPA is undergoing a moderate rate of natural erosion. The highest rate of natural erosion occurs in areas with low vegetative cover, soil crusting, and low organic matter content and on soft shales. Scattered areas of sand dunes are easily eroded by wind when vegetation is removed, and areas with unstable soils are susceptible to slumping, sliding, and creep. Areas with greater amounts of vegetative cover and organic matter content have a lower natural rate of erosion, as do areas with rock fragments on or near the surface.

3.1.5.2 Sensitive Soils

Sensitive soils are those soils that may require special attention as a result of surface-disturbing activities (BLM 1992). Sensitive soils are separated into three categories: (1) sandy soils, (2) unstable soils, and (3) erosive soils. Areas with sandy and other erosive/unstable soils are shown on Map 3.5. Unstable soils--those soils or soil groups susceptible to landslides or slumping activity which may be a hazard to permanent structures--are uncommon on the CD/WIIPA, occurring only along Delaney and Wamsutter Rim and in The Haystacks, where slopes are steep (see Map 3.2).

Sandy soils (i.e., soils coarser than sandy loams, such as loamy fine sands, loamy sands, and sands) are very susceptible to wind erosion when the protective vegetative cover has been removed. These soils are found on vegetated and stabilized dunes, uplands, and intermittent stabilized dunes on alluvial fans. No active sand dunes are known to occur in the CD/WIIPA. Sandy soils cover approximately 90,000 acres (8.5%) of the CD/WIIPA, primarily as dunes distributed throughout the area (see Map 3.5).

Erosive soils are considered sensitive because of their depth, texture, and/or position on the landscape, and most erosive soils in the CD/WIIPA are shallow (<20 inches to bedrock) and have low water-holding capacity and high runoff potential. These soils have a tendency to erode and often present management problems when they are disturbed. Erosive soils within the CD/WIIPA are soils associated primarily with relatively steep (30-60%) slopes.

Strongly saline and alkaline soils occur throughout the CD/WIIPA, but are not considered sensitive because with the application of appropriate reclamation procedures, revegetation of these soils can be successful.

3.1.6 Water Resources

3.1.6.1 Surface Water

Surface Water Occurrence. Surface water resources in the CD/WIIPA include numerous intermittent and ephemeral streams, perennial streams, ephemeral and intermittent lakes, livestock ponds, small detention reservoirs, seeps, and springs. The CD/WIIPA includes portions of two major watersheds--the Great Divide Basin to the north and the Washakie Basin to the south (Map 3.6). The Great Divide Basin (2,476,023 acres) is bounded by the continental divide on all sides and has no hydrologic outlet. The Washakie Basin is bordered by the continental divide on the north, the Sierra Madre Range on the east, the Little Snake River drainage on the south, and Kinney Rim on the west. Washakie Basin sub-watersheds in the CD/WIIPA include the Muddy Creek (668,608 acres), Northwest Little Snake River (551,737 acres), Northeast Vermillion Creek (179,383 acres), and East Bitter Creek (627,389 acres) watersheds (see Map 3.5) (USGS 1976; Seaber et al. 1987). Drainage from the Washakie Basin is to the Little Snake River or the Green River in the Colorado River watershed.

Sections of Antelope and Bitter Creek in southwestern portions of the CD/WIIPA are the only perennial streams occurring in the area. Antelope Creek is a tributary of Bitter Creek, which in turn flows to the Green River. Although both are considered perennial streams, periods of no flow may occur, especially during fall and winter. Most flow occurs in spring during snowmelt or after storms events. Other nonperennial streams in the CD/WIIPA are either ephemeral, flowing only briefly in the spring during snowmelt or after storms events, or intermittent, flowing only when and where ground water is exposed at the surface.

Sand Creek, which flows to the Little Snake River, and Shell Creek, which flows to the Green River via Vermillion Creek, originate near the southern edge of the CD/WIIPA. Whereas both streams are ephemeral in the CD/WIIPA, they both become perennial at downstream locations. Other major ephemeral/intermittent streams south of the Continental Divide include Barrel Springs Draw and North Barrel Springs. Flow in Barrel Springs Draw ranged from 0 to 0.56 cubic feet per second (cfs) and averaged 0.16 cfs during spring and summer months between 1986 and 1991 (BLM 1995a).

North of the Continental Divide, numerous ephemeral streams flow toward the center of the Great Divide Basin before disappearing into the soil or ending in natural or man-made impoundments. The volume of flow, distance they flow, and length of time they flow is directly related to the amount of precipitation. Other surface water features of the Great Basin Divide include several large ephemeral or intermittent lakes, most of which occur in the Chain Lakes area located in the northeast corner of the CD/WIIPA.

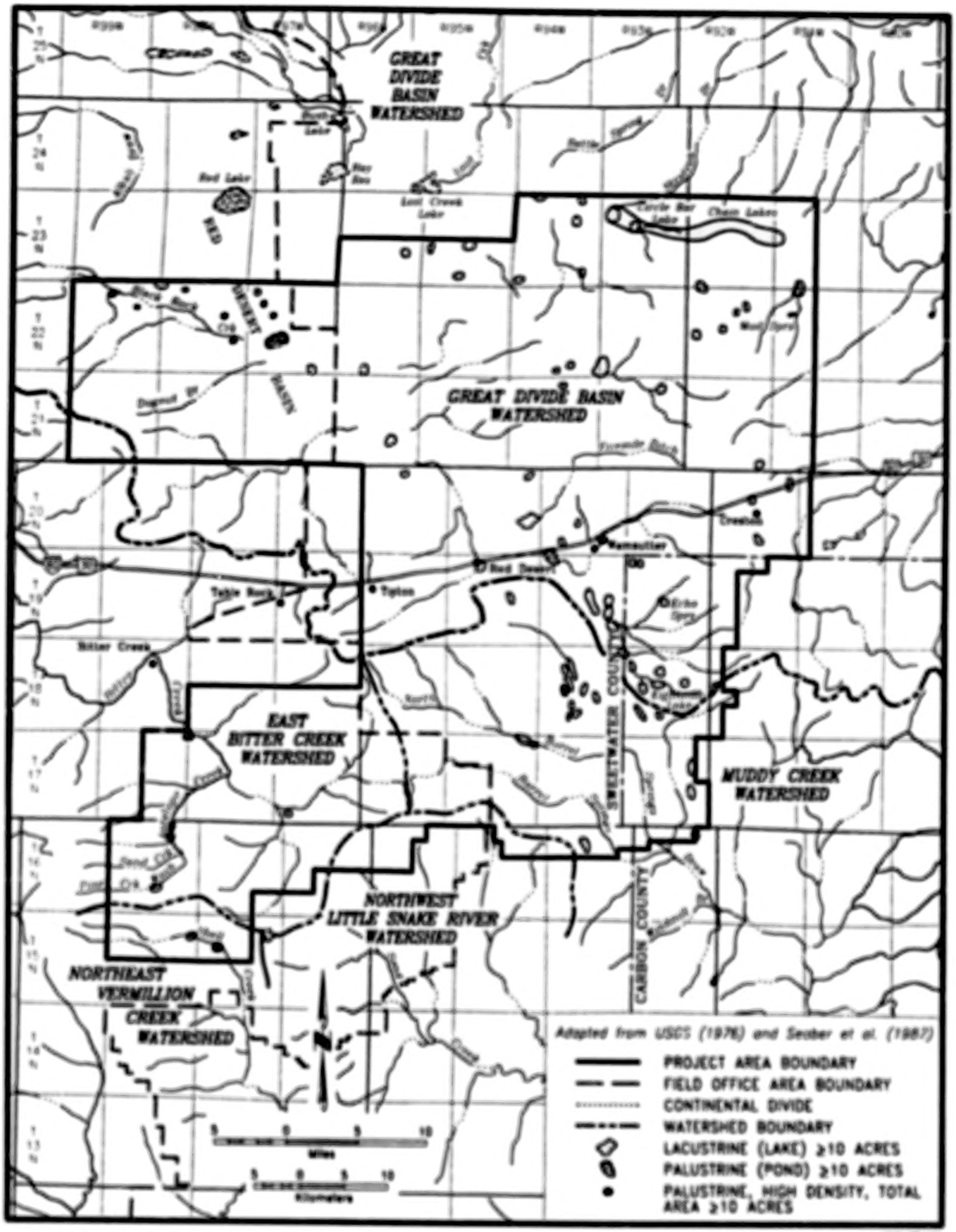
Numerous ponds, impoundments, and reservoirs occur in the CD/WIIPA (see Section 3.2.1.1) They are generally located along major drainages and are small and ephemeral, seasonal, or semipermanent (USFWS 1991).

Surface Water Quality and Use. Surface water quality data for the CD/WIIPA are limited; however, water quality is generally considered fair. All streams within the Washakie Basin and the Great Divide Basin on the CD/WIIPA are Class 4 waters (WDEQ 1990)--those waters other than Class 1 that do not support fisheries and are protected under WDEQ regulations for agricultural and wildlife watering uses. Designated uses for Antelope and Bitter Creek, which are the only perennial streams on the CD/WIIPA, are livestock and wildlife watering, irrigation, and industrial use (Gumtow 1994). Impounded water in the CD/WIIPA is used primarily for livestock and wildlife watering.

Existing surface water quality data for Barrel Springs Draw indicate that waters are relatively hard due to high levels of calcium (60.5 mg/l) and magnesium (23.6 mg/l). Total dissolved solids (TDS) concentrations average 3,889 mg/l, with sodium (1,147 mg/l) and sulfate (2,241 mg/l) the dominant ions (BLM 1994a).

Drainage from southern portions of the CD/WIIPA eventually flows to the Colorado River via the Little Snake and Green Rivers. The Little Snake and Green Rivers are Class 2 waters--waters that support or have the potential to support game fish or have nursery areas or food sources for game fish. Both support primary contact recreation, livestock and wildlife watering, irrigation, industrial, and human health value

100


GREAT DIVIDE BASIN WATERSHED
Red Lake
Lost Creek Lake
Circle Bar Lake
Chain Lakes
Battle Spring
GREAT DIVIDE BASIN WATERSHED
Creston
Wamsutter
Red Desert
Tipton
Table Rock
Bitter Creek
Echo Spring
SWEETWATER COUNTY
EAST BITTER CREEK WATERSHED
MUDDY CREEK WATERSHED
Sand Crk.
NORTHWEST LITTLE SNAKE RIVER WATERSHED
CARBON COUNTY
NORTHEAST VERMILLION CREEK WATERSHED
Miles
Kilometers
Adapted from USGS (1976) and Seeber et al. (1987)
PROJECT AREA BOUNDARY
FIELD OFFICE AREA BOUNDARY
CONTINENTAL DIVIDE
WATERSHED BOUNDARY
LACUSTRINE (LAKE) ≥10 ACRES
PALUSTRINE (POND) ≥10 ACRES
PALUSTRINE, HIGH DENSITY, TOTAL AREA ≥10 ACRES

Map 3.6 Watersheds and Wetlands, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

criteria (Gumtow 1994). The principal cause of water quality impairment in the Little Snake River is silt and sediment from natural erosion and erosion from highway, road, and bridge construction, vegetation removal, and wetland drainage and filling. The principal cause of water quality impairment in the Green River is silt and sediment from rangelands; municipal discharges; highway, road, and bridge construction; highway runoff; vegetation removal; and wetland drainage and filling (Gumtow 1994).

No water quality-limited water bodies are identified by the WDEQ (1996a, 1996b) on the CD/WIIPA, nor have any been identified within the Great Divide Basin, East Bitter Creek, and Northeast Vermillion Creek Watersheds (see Map 3.5). Within the Muddy Creek and Northwest Little Snake Watersheds (but outside the CD/WIIPA), six stream segments are designated as impaired (Table 3.8). Impaired and/or threatened stream uses include aquatic life in all segments; cold water fish in the Little Snake, Muddy Creek 2, McKinney Creek, and Littlefield Creek; and nongame fish, agriculture, and agricultural irrigation in Muddy Creek 1 and Cow Creek.

The Antelope/Bitter Creek drainage on and west of the CD/WIIPA were assessed for proper functioning condition (PFC) by the BLM in 1998 pursuant to BLM riparian area management guidelines (BLM 1995d). PFC as defined in BLM (1995d) is the minimum acceptable standard for stream function. Assessments revealed that the majority of the drainage was functioning-at-risk (FAR) and that some areas were nonfunctional (NF), (personal communication, July 1998, with Dennis Doncaster, BLM, Rock Springs). Areas designated as FAR are in less than minimal functional condition because existing soil, water, or vegetation attributes make them susceptible to degradation. Areas designated as NF are clearly not providing adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high flows and, thus, are not reducing erosion, improving water quality, and/or contributing other desirable conditions associated with PFC. Existing roads in the vicinity of the drainage are believed to be a primary contributing factor to the FAR/NF rating for the drainage.

Since southern portions of the CD/WIIPA are within the Colorado River watershed, all activities that potentially affect surface water quality must be in compliance with the *Colorado River Salinity Act* (Colorado River Basin Salinity Forum 1990), which states that average annual salinity in the lower main stem of the Colorado River system must be maintained at or below 1972 levels (723 mg/liter TDS below Hoover Dam). Summer TDS concentrations (1975-1986) in the Little Snake River near Dixon averaged approximately 150 mg/l (USGS 1993).

3.1.6.2 Ground Water

Ground Water Occurrence. Ground water within the CD/WIIPA occurs in both confined (artesian) and unconfined (water table) aquifers (Welder and McGreevy 1966). The confined aquifers are generally in pre-Oligocene rocks, whereas the unconfined aquifers are in upper Tertiary and Quaternary strata. Rock formations, the type of rock material the formations are composed of (lithologic properties), and their potential for ground water aquifers within the CD/WIIPA are listed in Table 3.9). Water-bearing formations deeper than the Mesaverde Group would not be affected by the proposed project and are not discussed.

The Great Divide and Washakie Basins are separated by the Wamsutter Arch and are essentially independent hydrologic systems (Welder and McGreevy 1966). However, these hydrologic systems are probably indirectly or partially connected. Sandstones are the predominant water-bearing rocks, and properties of individual aquifers are highly variable, depending on aquifer thickness, grain size and shape, sorting, and the areal extent of the aquifer. All of these factors affect the ability of an aquifer to store and transmit water.

Shallow Quaternary aquifers in the Washakie Basin are composed of loosely compacted sands and gravels and occur primarily along streams in the southwestern portions of the CD/WIIPA. These aquifers are typically highly permeable, transmit water to underlying aquifers, and do not yield significant amounts of water (Table 3.9) (Welder and McGreevy 1966). In the Great Divide Basin, Quaternary lake deposits dominate large areas in the eastern, central, and northern portions of the CD/WIIPA (see Map 3.3). These deposits are dominated by fine-grained sediments and generally do not yield significant amounts of water (Collentine et al. 1981); however, some dunal deposits in the Great Divide

Table 3.8 Impaired Stream Segments Within Project-affected Watersheds, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.[1]

Stream Segment Name	Priority[2]	Watershed	Causes of Impairment	Impairment Sources
Little Snake River	M	Northwest Little Snake and Muddy Creek	Siltation, flow alteration, unknown	Nonpoint sources, irrigated crops, road construction, petroleum activities, natural sources, unknown sources
Muddy Creek 1	L	Muddy Creek	Siltation, salinity/ TDS/chlorides, unknown	Nonpoint sources, range and pasture lands, road construction, petroleum activities, removal of riparian vegetation, natural sources, unknown sources
Muddy Creek 2	M	Muddy Creek	Siltation, unknown	Nonpoint sources, range and pasture lands, road construction, petroleum activities, natural sources, unknown sources
Cow Creek	U	Muddy Creek	Siltation, salinity/ TDS/chlorides, unknown	Rangeland, road construction, petroleum activities, removal of riparian vegetation, natural sources
McKinney Creek	M	Muddy Creek	Siltation, unknown	Nonpoint sources, pasture land, road construction, stream banks, unknown sources
Littlefield Creek	M	Muddy Creek	Siltation, unknown	Nonpoint sources, pasture land, channelization, stream banks, unknown sources

[1] Adapted from WDEQ (1996a, 1996b).

[2] M = medium; L = low; U = unknown.

Table 3.9 Stratigraphy and Potential Ground Water Occurrence, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.[1]

Age/Strata (approximate thickness in ft)	Lithology	Ground Water Potential
QUATERNARY		
Alluvial deposits (0-50)	Clay, silt, sand, and gravel, unconsolidated; includes some slope wash material	Contains small quantities of water in many stream valleys; generally small yields and a wide range in TDS
Windblown sand (0-70)	Sand and silt, unconsolidated; inactive sand dunes are scattered throughout the CD/WIIPA	In areas where the dunes are relatively thick and extensive, wells and springs yield 1 to 20 gallons per minute (gpm); TDS of water in the sand dunes ranges from 200 parts per million (ppm) to about 2,000 ppm; dunes act as infiltration areas for recharge to underlying formations
Gravel deposits (0-50)	Sand and gravel, poorly consolidated to unconsolidated, and some conglomerate, extensive but scattered outcrops are present southeast of the Great Divide Basin	Ground water potential is unknown, but probably poor because deposits are generally topographically high and probably well-drained
TERTIARY		
Laney Shale Member, Green River Formation (0-1,900)	Marlstone, shale, oil shale, muddy sandstone, tuffaceous sandstone, and algal limestone; the Laney may be as much as 3,000 ft thick in the Washakie Basin	Ground water potential is poor to good; wells in the western Washakie Basin have yields as high as 200 gpm and TDS ranging from 500 to 900 ppm; elsewhere in the Washakie Basin, wells have lower yields, and the water has a higher TDS
Cathedral Bluffs Tongue, Wasatch Formation (0-2,500)	Claystone and shale, gray, green, and red; contains fine-grained sandstone in the Washakie Basin	Very low yields of mineralized water in most of the area
Tipton Tongue/Tipton Shale Member, Green River Formation (0-400)	Oil shale, fine-grained calcareous sandstone, clay, shale, and algal limestone	Ground water potential is probably poor
Main body, Wasatch Formation (1,000-4,000)	Claystone and siltstone, brightly colored; fine- to medium-grained calcareous sandstone; carbonaceous shale, oil shale, and coal	A good source of water in the area; contains more than one aquifer; wells in the deeper aquifers flow in some areas; about 90 wells have yields from 5 to 250 gpm of water; the maximum yield may be as much as 500 gpm; TDS ranges from 500 to 2,800 ppm

Table 3.9 (Continued)

Age/Strata (approximate thickness in ft)	Lithology	Ground Water Potential
TERTIARY (Continued)		
Fort Union Formation (700-2,700)	Sandstone, fine- to coarse-grained, carbonaceous shale, and coal; contains varicolored siltstone and claystone in upper part	A relatively good water source in the area; yields of 11 wells ranged from 3 to 300 gpm; a well penetrating the entire formation where the sandstones are thickest may yield as much as 500 gpm; TDS of water from four wells ranged from about 800 to 3,320 ppm
Battle Spring Formation (1,000-4,500)	Sandstone, arkosic; fine- to coarse-grained green claystone; conglomerate and boulders	Ground water potential is very good; maximum yields might exceed 1,000 gpm; TDS ranges from about 200 to 1,000 ppm
CRETACEOUS		
Lance Formation (0-4,500)	Sandstone, very fine- to fine-grained, lenticular, clayey, calcareous; dark gray or brown shale; coal; and lignite	Ground water potential is largely unknown; seven stock wells have estimated yields of 5 to 30 gpm; maximum yields would likely be less than 300 gpm
Lewis Shale (0-2,700)	Shale, light to dark gray, calcareous to noncalcareous, carbonaceous; contains beds of siltstone and very fine-grained sandstone; numerous sandstones occur in the eastern Washakie Basin	Ground water potential is generally poor, but sandstones probably will yield small quantities of water
Mesaverde Group (300-2,800)	Sandstone, light gray to brown, very fine- to medium-grained, calcareous, silty; interbedded dark shale, lignite, and coal	Ground water potential is largely unknown; two wells have yields of about 5 and 40 gpm, and the water has TDS of 5,300 and 1,300 ppm, respectively

[1] Adapted from Welder and McGreevy (1966).

Basin have well yields as high as 20 gallons per minute (gpm) (Welder and McGreevy 1966). Ground water flow in the Quaternary aquifers is controlled in part by topography and gravity. Topography predominantly coincides with surficial structural features in and adjacent to the CD/WIIPA (see Maps 3.2 and 3.3). Downward flow from Quaternary aquifers into underlying formations is also common. In the Green River, Wasatch, Fort Union, Battle Spring, and Mesaverde aquifers, flow is from structural highs towards basin centers.

The other major source of ground water within both the Great Divide and Washakie Basins is from rocks formed during the Tertiary period. This group includes the: Laney Shale Member and Tipton Tongue/Tipton Shale Member of the Green River Formation, the Main Body and Cathedral Bluffs Tongue of the Wasatch Formation, the Fort Union Formation, and the Battle Spring Formation. Water wells in the Laney Shale Member of the Green River Formation yield 0-200 gpm (Table 3.9) (Collentine et al. 1981). Lower portions of the member may be dry. There are no specific ground water data for other members of the Green River Formation, although they are probably poor ground water producers due to the low permeability of marlstone and oil shale and the absence of thick and extensive sandstones (Welder and McGreevy 1966).

The Main Body of the Wasatch Formation is an important aquifer in both the Great Divide and Washakie Basins, especially along the flanks of the Wamsutter Arch (Table 3.9) (Welder and McGreevy 1966; Collentine et al. 1981). Most water wells in the Wasatch Formation are less than 1,000 ft deep, and data from 70 wells in the formation showed that most yielded less than 30 gpm; however, yields as high as 325 gpm have been noted. In the central Washakie Basin, the Wasatch Formation is deep and relatively inaccessible, but wells drilled near outcrops along the basin margin yield 1-400 gpm (Collentine et al. 1981).

Although the ground water production capabilities of the Fort Union Formation are not well-characterized, the formation is a relatively good source of water (Table 3.9) (Welder and McGreevy 1966). Wells in this formation yield from less than 100 to 300 gpm (Collentine et al. 1981).

The Battle Spring Formation is capable of yielding at least 150 gpm; however, most wells yield 30-40 gpm (Collentine et al. 1981). Welder and McGreevy (1966) indicate that wells can have yields of 1,000 gpm (Table 3.9).

Some water is produced from the deeper layers deposited during the Cretaceous, including the Lance Formation, the Lewis Shale, and the Mesaverde Group. Ground water production from the Lance Formation is adequate for stock and domestic supplies (Welder and McGreevy 1966), and wells in this formation yield 5-30 gpm (Collentine et al. 1981). Ground water potential from the Lewis Shale is limited to localized beds of fine-grained sandstone; therefore, small yields generally would be expected from wells in this formation. The Mesaverde Group is composed of fine- to medium-grained sandstone interbedded with coal, shale, and lignite (Table 3.9) (Welder and McGreevy 1966; Collentine et al. 1981). This group is confined by the Lewis Shale above and the Baxter Shale below and thus is effectively isolated from other aquifers. Wells yield 5-40 gpm.

The primary source of recharge for aquifers in the CD/WIIPA is from infiltration of snowmelt and runoff water where formations outcrop at the surface and downward seepage from overlying layers (Welder and McGreevy 1966). Discharge occurs primarily in surface playas, streams, and springs, especially along existing drainages. Some downward discharge to formations below the Mesaverde aquifer and subsurface flow to formations in Colorado also occurs.

Ground Water Quality and Use. Ground water quality is highly variable and depends on the physical properties of the supplying aquifer, the distance from the aquifer recharge area, and the degree of seepage into an aquifer from other formations (Table 3.10). In general, water quality is better near recharge areas and poorer toward the center of the basins (Collentine et al. 1981). WDEQ water quality standards are provided in Table 3.11.

TDS ranges from 200 mg/l to greater than 60,000 mg/l in Quaternary aquifers (Table 3.10) (Collentine et al. 1981). Tertiary aquifers typically have TDS levels of less then 600 mg/l to 1,500 mg/l in the vicinity of recharge areas. Water from the Wasatch Formation and the Laney Member of the Green River Formation tends to be saline along the eastern rim of the Washakie Basin, with TDS levels commonly exceeding 3,000 mg/l. Lance and Wasatch Formation ground waters tend to be sodium sulfate types. Battle Spring Formation aquifers have TDS levels of less than 750 mg/l. The Laney Member of the Green River Formation typically contains sodium, sulfate, and bicarbonate waters, and Fort Union water is highly variable.

Mesaverde ground water quality is also highly variable (Table 3.10). TDS in Mesaverde water is less than 1,000 mg/l in recharge areas only, and sodium and bicarbonate are the predominant ions. Towards the interior of the Washakie Basin, TDS levels of 1,000-3,000 mg/l are common in ground water from the Mesaverde Group. Stratigraphic gas traps in the Mesaverde Group are associated with areas of low aquifer permeability and probably contribute to high salinities (Collentine et al. 1981).

EPA drinking water standards for fluoride are locally exceeded in the Mesaverde and overlying aquifers (Collentine et al. 1981). The highest fluoride concentrations occur in the Mesaverde Group, Wasatch Formation, Laney Member of the Green River Formation, and Fort Union Formation. Some

Table 3.10 Constituent Concentrations in Selected Ground Waters of the Great Divide and Washakie Basins, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.[1]

Aquifer	Basin	TDS (mg/l)	Chloride (mg/l)	Sulfate (mg/l)	Ra-226[2] (pCi/l)	Gross Alpha[2] (pCi/l)	Uranium[2] (µg/l)
Quaternary	Great Divide	200 - 2,050	4 - 114	25 - 914	ND	ND	ND
	Washakie	200 - 60,700	9 - 31,000	15 - 1,450	ND	ND	ND
Wasatch	Great Divide	165 - 1,750	6 - 110	5 - 630	0.71 - 1.30	0 - 4.5	2.0 - 15.0
	Washakie	450 - 3,590	5 - 345	7 - 1,620	ND	ND	ND
Green River	Great Divide	560 - 1,810	2 - 105	10 - 600	ND	ND	ND
	Washakie	570 - 7,210	14 - 1,460	26 - 3,150	0	3.0	4.0
Battle Spring	Great Divide	88 - 750	2.9 - 35	0.7 - 375	0.04 - 33.50	0.3 - 282	<0.01 - 12.2
Ft. Union/ Lance	Great Divide	84 - 4,950	3 - 945	10 - 2,010	4.0	3.4	1.0
Mesaverde	Great Divide-Washakie	250 - 64,000	15 - 35,400	12 - 2,240	0.05 - 0.88	0 - 8.3	<0.01 - 34.0

[1] Adapted from BLM (1995b) and Collentine et al. (1981).

[2] ND = No data available.

ground water samples from the Mesaverde Group, Lance Formation, Fort Union Formation, and the Quaternary alluvium contain lead concentrations in excess of standards. The Fort Union, Lance, and Mesaverde ground waters also have areas with high concentrations of cadmium and chromium. Radionuclide levels are typically below WDEQ standards in Washakie and Great Divide Basin ground water (Tables 3.10 and 3.11); however, exceptions have been observed for Ra-226, gross alpha, and uranium in the Battle Spring Formation, gross alpha and uranium in the Mesaverde Group, and uranium in the Wasatch.

Much of the water used for industrial, agricultural, and domestic purposes on and adjacent to the CD/WIIPA is supplied by surface water sources including the Little Snake River and Green River (Collentine et al. 1981). In 1981, less than one-third of the water used in the region was supplied by ground water. Industrial usage associated with energy resource development and electric power generation accounts for a large proportion of the ground water use. There are 924 permitted water wells within the CD/WIIPA, and most of these are used for industrial purposes--primarily (668 wells) as development and monitoring wells for the oil and gas, coal, and uranium industries (WSEO 1996, 1997). Agricultural usage is limited to 182 wells developed for stock-watering, and 162 wells are used for domestic purposes. Most wells on the CD/WIIPA are 100-1,000 ft deep and yield less than 100 gpm.

3.1.7 Noise and Odor

The decibel (dB) is the measurement unit commonly used to describe sound levels. Sound measurement is further refined by using an "A-weighted" decibel (dBA) scale which emphasizes the audio frequency response curve audible to the human ear. Thus, the dBA measurement more closely describes how a person perceives sound. Several factors influence the transmission of sound, including the type of noise source, the frequency content of the noise source,

Table 3.11 Water Quality Standards, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.[1]

Class	TDS (mg/l)	Chloride (mg/l)	Sulfate (mg/l)	Ra-226 (pCi/l)	Gross Alpha (pCi/l)	Uranium (mg/l)
I (Domestic Use)	500	250	250	5	15	5.0
II (Agricultural Use)	2,000	100	200	5	15	5.0
III (Livestock Use)	5,000	2,000	3,000	5	15	5.0
A (Fish/Aquatic Life)	500 - 2,000[2]	–	–	5	15	0.03 - 1.4[3]

[1] Adapted from WDEQ (1993).

[2] Variable dependent upon life requirements (e.g., egg hatching, fish rearing).

[3] Dependent upon hardness.

molecular absorption, anomalous excess attenuation, wind, temperature gradients, precipitation, terrain, and vegetation effects (personal communication, 1995, with Paul Bollard, Brown-Buntin Associates, Inc.). Examples of common sounds and their sound levels (dBA) include: heavy construction equipment-90 dBA at 50 ft; light automobile traffic-50 dBA at 100 ft; conversation-50 dBA at 12 ft; and winds-approximately 32 dBA at 12 mph. Sound levels are generally considered quiet at 30 to 60 dBA, moderate at 60 to 90 dBA, and loud at 90 to 110 dBA.

Ambient noise level is the composite of noise from all sources near and far and constitutes the normal or existing level of environmental noise at a given location. Ambient noise levels throughout the majority of the CD/WIIPA are generally rural in nature, with the only appreciable noise sources being from traffic along roadways, oil and gas exploration and production activities, occasional air traffic, recreational activities, and wind. Typical noise levels for similar rural locations vary from 20 to 40 dBA. Noise-sensitive areas on the CD/WIIPA include human dwellings, occupied big game crucial winter range during crucial winter periods, sage grouse leks during the breeding season, and occupied raptor nests. Ambient noise levels in the CD/WIIPA result primarily from near constant winds, but also include other transient noise sources. The relationship between wind speed and noise, as measured in decibels, varies due to climatic conditions such as temperature and humidity (Brown-Buntin Associates Inc. 1994). Wind speeds and resulting noise vary depending on time of day and season of the year (Martner 1986). Wind speeds are generally 2-6 mph higher from late morning to early evening year-round. During the months of June-October, wind speeds average 10.6 mph (approximately 28 dBA), whereas November-May speeds average 13 mph (approximately 35 dBA). Ambient noise levels during periods of the highest average wind speeds (i.e., late afternoons in March-April) could exceed 50 dBA.

Extant vehicular traffic in the CD/WIIPA contributes to ambient noise levels. Vehicle noise varies based on vehicle size, load, speed, and road surface. A heavily loaded truck traveling at highway speeds can produce up to 90 dBA; however, at slower speeds the same truck may produce only 70 dBA.

Existing oil and gas exploration and production activities create noise from: road, well pad, pipeline, and ancillary facility construction; well drilling, completion, and workovers; flaring of gas streams; production facility operations; traffic; and other associated sources. Much of the noise generated during oil and gas development activities are vehicle-related (e.g., heavy equipment transportation, drill equipment and supply hauling, and worker transportation). Heavy equipment used in road, well pad, pipeline, and compressor station construction, such as bulldozers and backhoes, may produce 85-90 dBA at 50 ft (Brown-Buntin Associates Inc. 1994), and well drilling activities may produce 115 dBA at the source to 55 dBA at 0.7 mi (BLM 1991b).

Ambient noise levels on the CD/WIIPA and adjacent areas were measured in May 1996 using a SPER Scientific Digital Sound Meter (Model #840029) (Figure 3.3). Measurements were taken at 1-minute intervals for 5 minutes at each location and at variable distances from noise sources. Background noise levels ranged from 37.3 dBA (at a sage grouse lek) to 72.2 dBA along I-80 (at ROW fence). Greatest noise levels were from drilling and flaring operations, which had noise levels of 77.5 and 97.9 dBA, respectively, at their sources. Drilling rig noise was 50.1 dBA at 0.25 mi, and flaring noise was 66.3 dBA at 0.1 mi. Noise levels from on-location production facilities averaged 47.5 dBA at the source, and noise from compression facilities was 63.8 dBA at the source and 39.5 dBA at 0.25 mi.

During oil and gas development activities, several noise sources could be operating simultaneously (i.e., drill rig operation, truck traffic, personnel traffic, and associated noises). The simultaneous operation of two equal noise sources results in a combined noise level which is approximately 3 dBA greater than the individual values (i.e., 80 dBA + 80 dBA = 83 dBA). The addition of a 75 dBA source to an existing 80 dBA source results in a noise level of 81 dBA. If the difference in noise levels between two sources is greater than 10 decibels, the combined noise level is essentially that of the louder source (Thumann and Miller 1986).

No specific data on odors are available for the CD/WIIPA; however, odors present in the area, other than the natural odors of vegetation and wildlife, are associated with livestock operations, existing oil and gas developments, and vehicular traffic. Most odors on the area are likely to be quickly dispersed by wind.

3.2 BIOLOGICAL RESOURCES

3.2.1 Vegetation

Vegetation types on the CD/WIIPA were determined from satellite imagery and computer enhancement techniques in the Wyoming Gap Analysis Land Cover Map (personal communication, June 1995, with Jeff Hammerlinck, Geographic Information System (GIS) Coordinator, UW, Laramie, and Ken Driese, Research Assistant, Department of Botany, UW, Laramie). Map 3.7 illustrates the vegetation types and their location on the CD/WIIPA and surrounding areas.

The Wyoming big sagebrush vegetation type is the most abundant type in the CD/WIIPA, covering approximately 731,900 acres--69.0% of the CD/WIIPA (Map 3.6, Table 3.12). Wyoming big sagebrush is the dominant species, with total shrub cover comprising more than 25% of the total vegetative cover. This vegetative type is variable and includes areas with dense homogenous Wyoming big sagebrush to sparsely vegetated arid areas where Wyoming big sage is the dominant shrub. Patches of Wyoming big sagebrush are often found in association with areas dominated by mixed grasses. The type is often found on rolling landscapes, with Wyoming big sagebrush on broad slopes, sand sagebrush and various cushion plants on wind-swept ridges and knolls, and mountain big sagebrush in the hollows.

The greasewood fans and flats type has black greasewood as the dominant species and covers approximately 151,100 acres (14.2%) of the CD/WIIPA (Map 3.7, Table 3.12). Greasewood comprises more than 75% of the total shrub cover and shrubs comprise more than 25% of the total vegetative cover. The type is generally found along streams at low to medium elevations, although it can occur on fine-textured saline upland areas and on basin fans and flats. Greasewood is also frequently found in areas classified as shrub-dominated riparian.

The desert shrub type is dominated by a mixture of shrubs occurring in dry salty habitats. Shrub cover is often by shadscale saltbush but can be a mixture of Gardner's saltbush, greasewood, and/or desert cushion plants. Total shrub cover comprises more than 25% of the total vegetative cover. The type is usually found on flats and fans and covers

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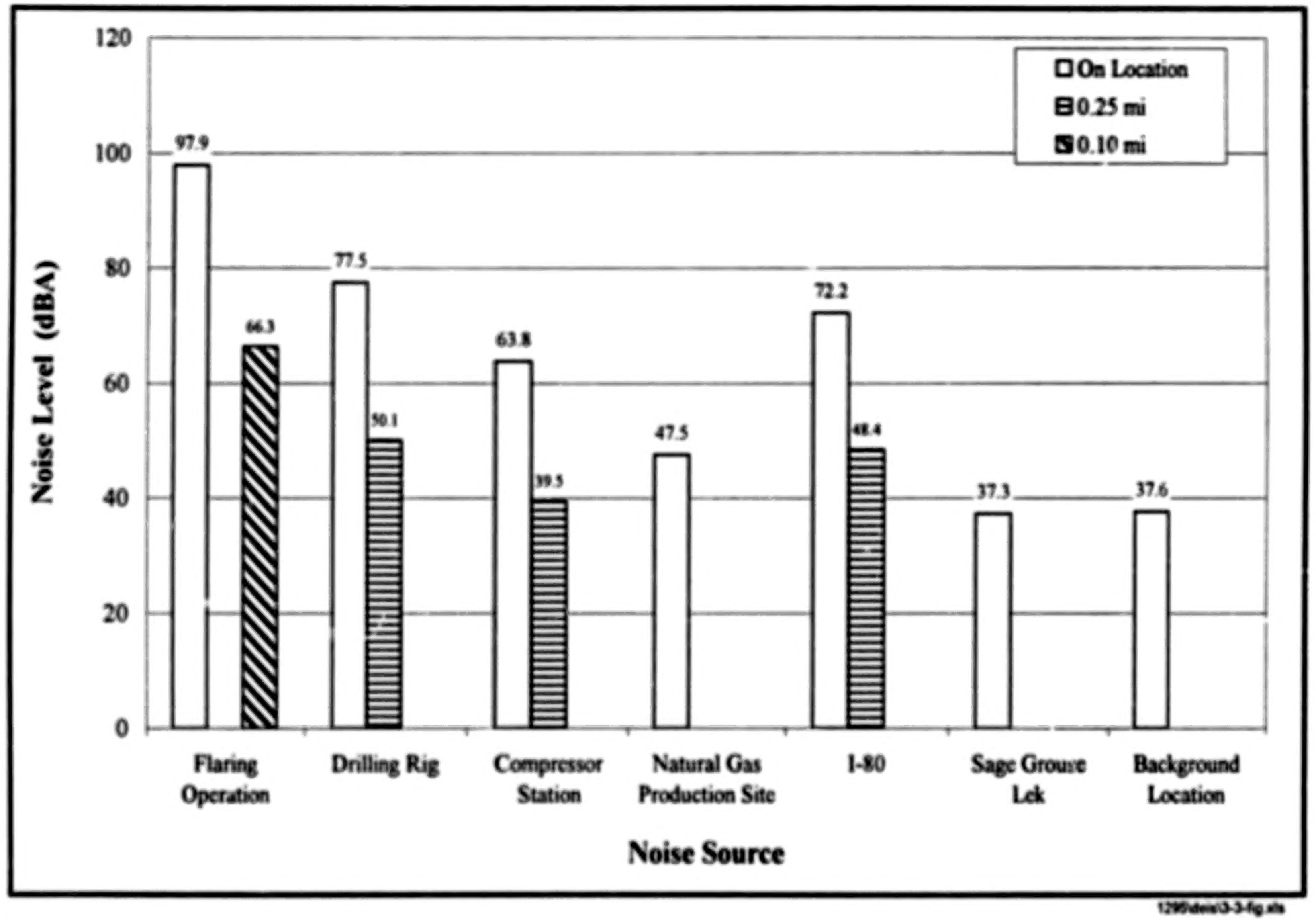

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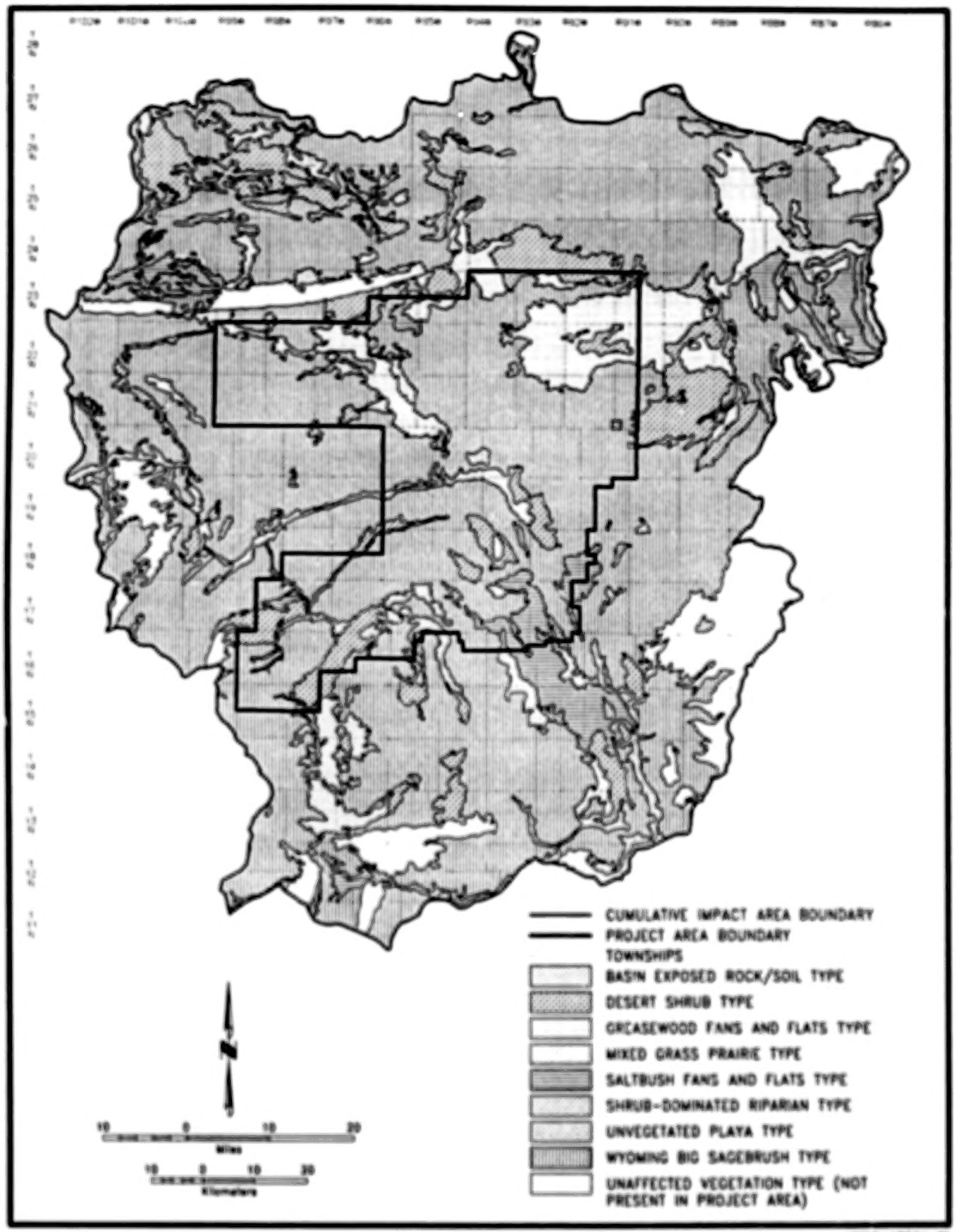
Figure 3.3 Existing Noise Sources and Average Noise Levels, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.


CUMULATIVE IMPACT AREA BOUNDARY
PROJECT AREA BOUNDARY
TOWNSHIPS
BASIN EXPOSED ROCK/SOIL TYPE
DESERT SHRUB TYPE
GREASEWOOD FANS AND FLATS TYPE
MIXED GRASS PRAIRIE TYPE
SALTBUSH FANS AND FLATS TYPE
SHRUB-DOMINATED RIPARIAN TYPE
UNVEGETATED PLAYA TYPE
WYOMING BIG SAGEBRUSH TYPE
UNAFFECTED VEGETATION TYPE (NOT PRESENT IN PROJECT AREA)
N
10 0 10 20
Miles
10 0 10 20
Kilometers

Map 3.7 Vegetation Types, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

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Table 3.12 Vegetation Types, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Vegetation Type	Acres	Percent
Wyoming big sagebrush	731,900	69.0
Greasewood fans and flats	151,100	14.2
Desert shrub	97,100	9.2
Saltbush fans and flats	40,600	3.8
Basin exposed rock/soil	31,000	2.9
Shrub-dominated riparian	4,500	0.4
Unvegetated playa	3,400	0.3
Mixed grass prairie	1,600	0.2
Total	1,061,200	100.0

approximately 97,100 acres (9.2%) of the CD/WIIPA (Map 3.7, Table 3.12).

The saltbrush fans and flats type covers 40,600 acres (3.8%) of the CD/WIIPA (Map 3.7, Table 3.12). Gardner's saltbush is the dominant species, comprising more than 75% of the total vegetative cover. These relatively pure stands of saltbush are often sparsely vegetated, and bare soil covers much of the land surface. More than 25% of the total vegetative cover is in shrubs.

The basin exposed rock/soil type is found on scarps, badlands, rock outcrops, and unvegetated cliffs. The type is characterized by vegetative cover of less than 15%. Approximately 31,000 acres (2.9%) of the CD/WIIPA is in this type (Map 3.7, Table 3.12).

The shrub-dominated riparian type covers approximately 4,500 acres (0.4%) of the CD/WIIPA, and includes any riparian zone where shrubs comprise more than 25% and trees comprise less than 25% of the total vegetative cover (Map 3.7, Table 3.12). Shrubs often include willow, sagebrush, and greasewood.

The unvegetated playa type includes bare saline playa areas, mud flats, shorelines, sand beaches, and gravel bars. Very sparse salt-tolerant vegetation such as pickleweed may be present around the margins, but total vegetative cover is less than 10%. The CD/WIIPA includes 3,400 acres of this type--less than 0.3% of the total area (Map 3.7, Table 3.12).

The mixed grass prairie type contains a mixture of short- and tall-grass prairie species, including western wheatgrass, blue grama, threadleaf sedge, needle-and-thread, Sandberg bluegrass, Douglas rabbitbrush, horsebrush, and Indian ricegrass. This type does not contain buffalo grass, considered an indicator of short-grass prairie. Mixed grass prairie often occurs in patches intermixed with shrubs such as big sagebrush where grass occupies more than 50% of the landscape. The CD/WIIPA includes approximately 1,600 acres (0.2% of the area) of this habitat type (Map 3.7, Table 3.12).

Noxious weeds known to exist on the CD/WIIPA include hoary cress, houndstongue, black henbane, and Canada thistle.

3.2.1.1 Wetlands

Maps produced for the National Wetlands Inventory (USFWS 1991) and BLM and GHEP (1995a, 1995b) were examined to identify potential wetlands in the CD/WIIPA. Wetlands--including ponds, reservoirs, and streams--cover approximately 9,200 acres (<1%) of the CD/WIIPA and occur as inclusions within the eight vegetation types described in Section 3.2.1. Ponds and reservoirs (>10 acres) on the CD/WIIPA are shown on Map 3.6. Wetlands of less than 10 acres are scattered throughout the CD/WIIPA and are primarily associated with stream channels and impoundments. The greatest concentration of wetlands occurs in the northeast portion of the CD/WIIPA in the Chain Lakes area.

Wetland vegetation on the CD/WIIPA is generally dominated by grasses and grass-like species, with forbs and woody plants being much less abundant (U.S. Soil Conservation Service [SCS] 1988; BLM and GHEP 1995b). Common wetland grass and grass-like species include common spike-rush, baltic rush, alkali grass, Nebraska sedge, foxtail barley, slender muhly, tufted hairgrass, and sedges. Common forb species include deep-root poverty-weed, western yellowcress, and buttercup species, whereas common shrub species include silver sage, willow, and rose. Vegetation cover in wetlands averages between 85 and 100%.

The primary functional values of wetlands in the area include ground water recharge, nutrient retention and removal, and sediment trapping (BLM and GHEP 1995b). Other important functional values include ground water discharge, food chain support, and wildlife habitat.

3.2.1.2 Productivity

Vegetative production on the CD/WIIPA is quite variable, with annual production on excellent-condition rangelands during normal years ranging from <250 to 350 lbs/acre in the basin exposed rock/soil, unvegetated playa and mixed grass prairie types to 5,000 lbs/acre in wetlands (SCS 1988). In the Wyoming big sagebrush, saltbush fans and flats, greasewood fans and flats, and desert shrub types, annual production on excellent condition rangelands during normal years ranges from 600 to 1,500 lbs/acre. Annual production during normal years on excellent condition shrub-dominated riparian areas averages 2,300 lbs/acre.

An animal unit month (AUM) is defined as the amount of forage required to maintain a 1,000 lb cow and a calf under 6 months of age, five sheep, or 1.25 horses for 1 month and is the unit most often used to define recommended stocking rates (AUMs/acre) on lands in the CD/WIIPA. AUMs/acre on the CD/WIIPA range from 0.1 in exposed and unvegetated areas to 3.0 in wetland areas. In shrub-dominated areas, stocking rates range from 0.3 to 0.6 AUMs/acre.

3.2.2 Wildlife and Fisheries

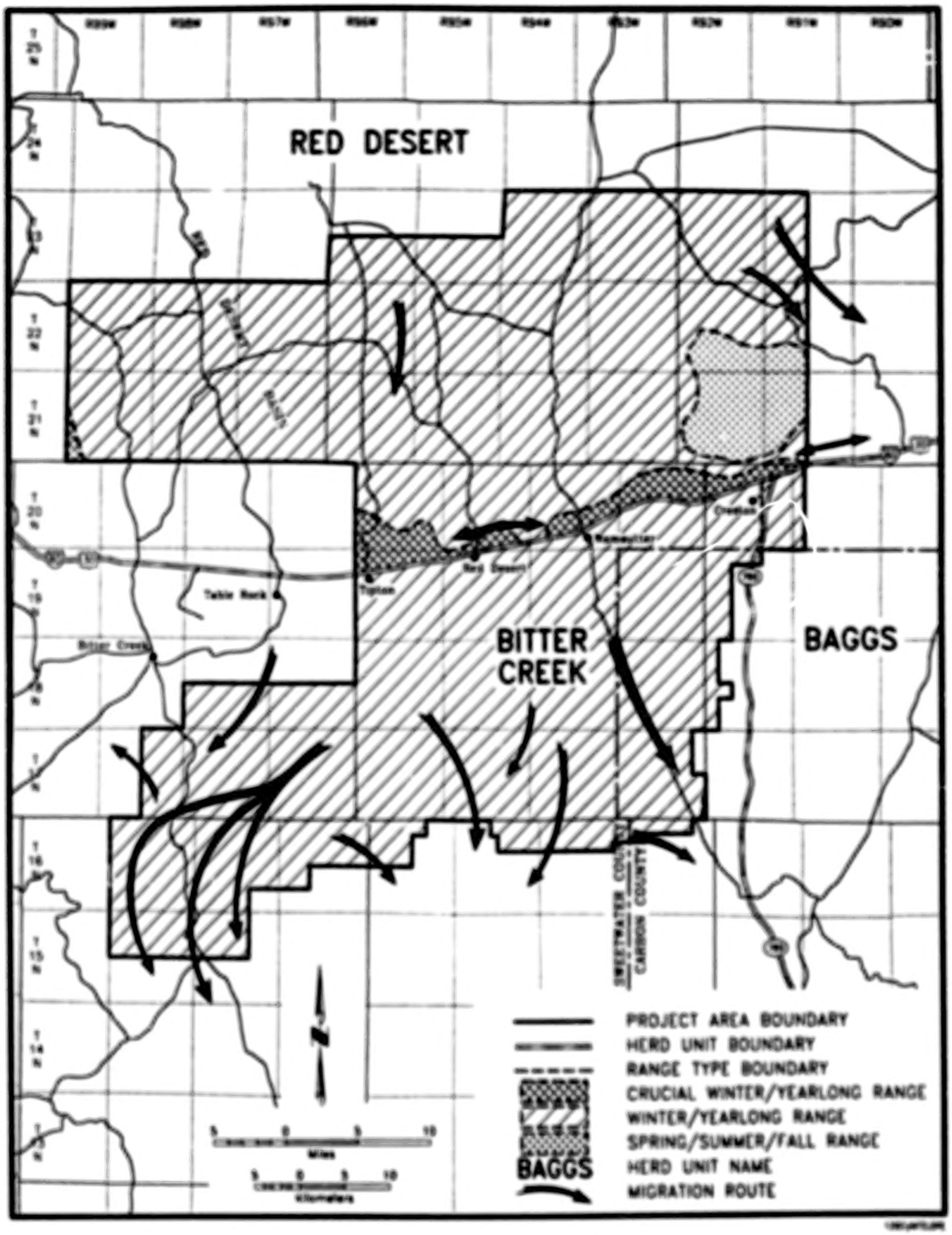
The topography, soils, water resources, and vegetation on the CD/WIIPA provide habitats used by numerous wildlife species.

3.2.2.1 Big Game

Three big game mammal species occur within or immediately adjacent to the CD/WIIPA: pronghorn, mule deer, and elk. The population estimates for big game herds provided below are based upon WGFD models and the reader is encouraged to refer to the Annual Big Game Herd Unit Reports (WGFD 1997a, 1997b) for specific information regarding these estimates.

Pronghorn. Pronghorn in the CD/WIIPA belong to the Baggs, Bitter Creek, or Red Desert herd units. The Baggs herd unit, which includes hunt area 55 on the CD/WIIPA, lies east of State Highway 789 and south of I-80 (Map 3.8). The WGFD population objective for this herd is 9,000 animals, and the estimated end-of-year population in 1996 was 4,100 animals, or 46% of objective (Table 3.13). The 5-year (1991-1995) population average was 6,660 animals, or 74% of objective. The Baggs herd is not a discrete herd unit due to movement across Muddy Creek, Sage Creek, State Highway 789, and the Colorado border (WGFD 1995a).

The Bitter Creek herd unit includes hunt areas 57 and 58 on the CD/WIIPA and lies south of I-80 and west of State Highway 789 (see Map 3.7). The WGFD population objective for this herd is 25,000 animals, and the estimated end-of-year population in 1996 was 17,500 or 70% of objective (Table 3.13). The 5-year



Map 3.8 Pronghorn Herd Units and Range Types, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

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Table 3.13 Big Game Herd Unit Populations, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming.[1]

Species/Herd Unit	Population Objective	1996 End-of-year Population	1996 Population as % of Objective	5-year Population Average	Population Average as % of Objective
PRONGHORN					
Baggs	9,000	4,100	46	6,660[2]	74
Bitter Creek	25,000	17,500	70	18,760[2]	75
Red Desert	15,000	10,500	70	12,100[3]	81
MULE DEER					
Baggs	18,700	20,000	107	18,025[2]	96
Chain Lakes	500	290	58	332[3]	66
South Rock Springs	12,000	6,000	50	6,400[2]	53
Steamboat	4,000	2,600	65	2,557[2]	64
ELK					
Petition	200[4]	270	135	207[5]	104
Shamrock	75	117	156	122[3]	163
Sierra Madre	4,200	6,670	159	6,605[2]	157
Steamboat	500	660	132	614[3]	123

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[1] Adapted from WGFD (1997a, 1997b).
[2] 1991-1995.
[3] 1992-1996.
[4] Interim objective.
[5] 4-year average (1993-1996).

population average was 18,760 animals (75% of objective).

The Red Desert herd unit includes hunt areas 60 and 61 on the CD/WIIPA north of I-80 (see Map 3.8). The WGFD population objective for the Red Desert herd is 15,000 antelope, and the end-of-year population estimate for 1996 was 10,500 animals, or 70% of objective (Table 3.13). The 5-year population average was 12,100, (81% of objective).

The majority (93.5%) of the pronghorn range on the CD/WIIPA is winter/yearlong habitat (Table 3.14, Map 3.8). Winter/yearlong range is that range of which a portion is used yearlong, but during winter (December 1 to April 30) has a significant influx of animals from other seasonal ranges (WGFD n.d.). Approximately 27.2% (502,532 acres) of the winter/yearlong range for the Red Desert herd is contained within the CD/WIIPA (Table 3.14). 29.3% **[words?]** (481,148 acres) of winter/yearlong range for the Bitter Creek herd is within the CD/WIIPA and 2.8% (8,626 acres) of winter/yearlong range for the Baggs herd is in the CD/WIIPA.

Approximately 3.0% of the CD/WIIPA (31,749 acres) is considered pronghorn crucial winter/yearlong range (Table 3.14, Map 3.8). Crucial winter/yearlong range is defined as winter/yearlong range that has been documented by the WGFD as the determining factor in the ability of a big game population to maintain itself at a desired level over the long term (WGFD n.d.). The crucial winter/yearlong range within the CD/WIIPA is in the Red Desert herd (31,511 acres, 11.6% of this range type for the entire herd) and the Bitter Creek herd (238 acres, 0.1% of this range type for the entire herd) (Table 3.14). Crucial pronghorn range on the CD/WIIPA is considered a SRA (see Map 2.3).

A portion of the Chain Lakes Wildlife Habitat Management Unit occurs in the northeastern corner of the CD/WIIPA. The unit is jointly managed by the WGFD and the BLM as pronghorn winter range; however, this range is not considered crucial to meeting the population objectives of the Red Desert pronghorn herd (personal communication, June 1995, with Bill Gerhart, Assistant Supervisor, Habitat Branch, WGFD).

The remaining 3.5% of the CD/WIIPA (37,145 acres) is spring/summer/fall range for the Red Desert pronghorn herd (Table 3.14, Map 3.8). Spring/summer/fall range is used annually from about May 1 to November 30, although this period may be shorter during years with severe winters; this range type is unable to support a big game population during persistent winter conditions (WGFD n.d.). Spring/summer/fall range within the CD/WIIPA represents 85.7% of this range type within the Red Desert herd unit (Table 3.14).

Pronghorn occur throughout the CD/WIIPA during spring, summer, and fall; however, during the winter months they migrate to crucial winter/yearlong ranges located within, south, and east of the CD/WIIPA (see Map 3.8). I-80 forms an effective barrier to migration along the southern border of the Red Desert herd unit resulting in little movement of antelope from this herd to crucial winter/yearlong range in the Bitter Creek and Baggs herd units. Instead, these animals use the crucial winter/yearlong range immediately north of I-80 in the central CD/WIIPA (see Map 3.8). Pronghorn in the northeast CD/WIIPA move to crucial winter/yearlong range east of the CD/WIIPA. Animals in the Baggs and Bitter Creek herds move south to crucial winter/yearlong range located along the Wyoming-Colorado border (see Map 3.8). The timing of seasonal movements and the extent to which crucial winter/yearlong range is used are dependent on weather and snow depth (Yoakum 1978; Guenzel 1986; Deblinger 1988).

Whereas heavy traffic and ROW fencing along I-80 essentially eliminates pronghorn movement between the Red Desert and the Bitter Creek herds, the majority of roads within the CD/WIIPA are unpaved resource roads and unimproved two-track roads that do not impede pronghorn movements. Several improved county and BLM gravel roads traverse the CD/WIIPA; it is possible that these roads occasionally limit pronghorn movement due to periods of increased traffic or during the winter when deep snow may collect in roadside ditches (Bruns 1977).

Fences can also impede pronghorn movement (Autenrieth 1983; Deblinger 1988). Deep snow and poor fence design (e.g., low bottom wire, sheep mesh), in combination, have been reported as significant sources of winter pronghorn mortality (Yoakum 1978, Deblinger 1988). Some fences within the CD/WIIPA

Table 3.14 Acreage and Percentage of Wildlife Habitats, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Wildlife Resource	Acreage of Wildlife Habitat Within the CD/WIIPA	Percentage of CD/WIIPA	Total Acreage of Range Type for the Herd Unit	Percentage of Range Type for the Herd Unit on the CD/WIIPA
Pronghorn				
Baggs Herd				
Winter/yearlong range	8,626	0.8	303,616	2.8
Bitter Creek Herd				
Crucial winter/yearlong range	238	<0.1	194,304	0.1
Winter/yearlong range	481,148	45.3	1,644,800	29.3
Red Desert Herd				
Crucial winter/yearlong range	31,511	3.0	272,704	11.6
Spring/summer/fall range	37,145	3.5	43,328	85.7
Winter/yearlong range	502,532	47.4	1,849,024	27.2
Totals				
Crucial winter/yearlong range	31,749	3.0	--	--
Spring/summer/fall range	37,145	3.5	--	--
Winter-yearlong range	992,306	93.5	--	--
Mule Deer				
Baggs Herd				
Crucial winter/yearlong range	11,969	1.1	255,552	4.7
Winter/yearlong range	435,719	41.1	1,438,528	30.3
Chain Lakes Herd				
Yearlong range	61,858	5.8	180,288	34.3
South Rock Springs Herd				
Spring/summer/fall range	32,363	3.0	342,848	9.4
Winter/yearlong range	10,571	1.0	785,856	1.3
Steamboat Herd				
Spring/summer/fall range	1,778	0.2	105,664	1.7
Winter/yearlong range	42,648	4.0	642,668	6.6
Totals				
Crucial winter/yearlong range	11,969	1.1	--	--
Spring/summer/fall range	34,141	3.2	--	--
Winter/yearlong range	488,938	46.1	--	--
Yearlong range	61,858	5.8	--	--

Table 3.14 (Continued)

Wildlife Resource	Acreage of Wildlife Habitat Within the CD/WIIPA	Percentage of CD/WIIPA	Total Acreage of Range Type for the Herd Unit	Percentage of Range Type for the Herd Unit on the CD/WIIPA
Elk				
Petition Herd (ranges undetermined)	481,837	45.4	1,836,096	26.2
Shamrock Herd				
Yearlong range	56,619	5.3	192,896	29.4
Steamboat Herd				
Crucial winter/yearlong range	18,116	1.7	276,544	6.6
Winter range	57,045	5.4	214,592	26.6
Winter/yearlong range	1,183	0.1	224,064	0.5
Yearlong range	6,210	0.6	57,216	10.9
Totals				
Crucial winter/yearlong range	18,116	1.7	--	--
Winter range	57,045	5.4	--	--
Winter/yearlong range	1,183	0.1	--	--
Yearlong	62,829	5.9	--	--
Raptors				
Potential habitat[1]	1,061,200	100.0	--	--
Suitable nesting habitat[2]	194,400	18.3	--	--
Sage Grouse				
Potential breeding habitat[3]	7,000	0.7	--	--
Probable nesting habitat[4]	340,200	32.1	--	--

[1] Assumes the entire CD/WIIPA is suitable raptor foraging habitat.

[2] Assumes all RCAs, other areas with relatively high densities of raptor nests, and areas within 1.0 mi of all other raptor nests on the CD/WIIPA (see Map 3.12) are suitable for raptor nesting.

[3] Assumes areas within 0.25 mi of known lek sites on the CD/WIIPA are suitable for sage grouse breeding.

[4] Assumes areas within 2.0 mi of known lek sites on the CD/WIIPA are suitable for sage grouse nesting.

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may impede local and seasonal movements of pronghorn, although no specific problem fences have been reported by the BLM or WGFD.

Mule Deer. Mule deer in the CD/WIIPA belong to the Baggs, Chain Lakes, South Rock Springs, or Steamboat herds. The Baggs herd unit includes hunt areas 85 and 100 on the CD/WIIPA and covers the CD/WIIPA south of I-80 and east of the Bitter Creek Road (Map 3.9). The WGFD population objective for the Baggs herd is 18,700 animals, and the estimated end-of-year population in 1996 was 20,000 animals (107% of objective) (Table 3.13). The 5-year population average was 18,025 animals, or approximately 96% of objective.

The Chain Lakes herd unit includes hunt area 98 on the CD/WIIPA and overlaps the eastern portion of the CD/WIIPA north of I-80 and east of the Wamsutter Road (Map 3.9). The population objective for this herd is 500 animals, and the estimated end-of-year population in 1996 was 290 mule deer (58% of objective) (Table 3.13). The 5-year (1992-1996) average for this herd unit was 332 animals, or approximately 66% of objective.

The South Rock Springs herd unit includes hunt area 101 on the CD/WIIPA and covers the southwest corner of the area west of the Bitter Creek Road (Map 3.9). The current population objective for this herd is 12,000 animals, and the estimated population for 1996 was 6,000 animals or 50% of objective (Table 3.13). The estimated 5-year average population for this herd was 6,400 (53% of objective). The primary management concern for the South Rock Springs herd has been the low recruitment rate (WGFD 1995a). It is possible that the cumulative impacts of habitat degradation and/or succession, interspecific competition, and human developments such as Flaming Gorge Reservoir have contributed to this relatively low recruitment. To address this problem, the WGFD has recently undertaken a multi-year habitat improvement project (WGFD 1995a).

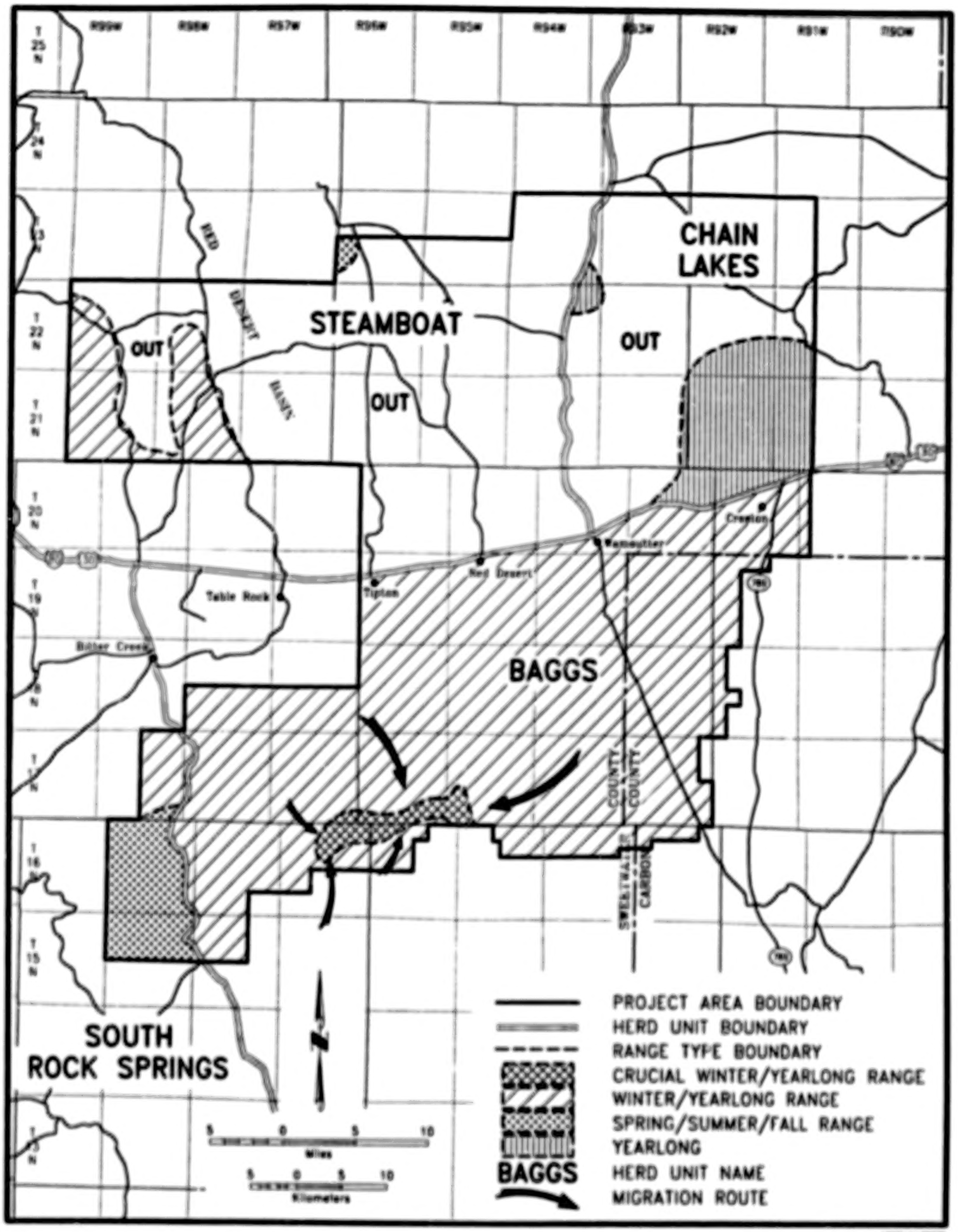
The Steamboat herd unit includes mule deer hunt area 131 on the CD/WIIPA and is located in desert habitat in the northwest portion of the area (Map 3.9). The WGFD population objective for this herd is 4,000, and the population in 1996 was estimated at 2,600 deer (65% of objective) (Table 3.13). The estimated average 5-year population for this herd was 2,557 (64% of objective). Extremely low fawn crops in 1992 and 1993 and the harsh winter of 1992-1993 contributed to the decline of this population (WGFD 1995a). Despite improved fawn production in 1994, it will likely take several years for this herd to recover to 1991 levels.

Approximately 46.1% of the CD/WIIPA (488,938 acres) is considered winter/yearlong mule deer range (Table 3.14). The majority (89.1%) of winter/yearlong range is located south of I-80 in the Baggs herd unit, with only small portions occurring in the South Rock Springs and Steamboat herd units. The 435,719 acres of winter/yearlong range for the Baggs herd within the CD/WIIPA represents 30.3% of the total winter/yearlong range for the herd. Approximately 6.6% of the winter/yearlong range for the Steamboat herd (42,648 acres) and 1.3% of this range for the South Rock Springs herd is included in the CD/WIIPA (Table 3.14).

Crucial winter/yearlong mule deer range accounts for 1.1% (11,969 acres) of the CD/WIIPA and is located wholly within the Baggs herd (Table 3.14, Map 3.9). Mule deer in the Baggs herd move into this crucial range in The Haystacks area during severe winters or periods of severe weather in normal winters. Crucial mule deer range on the CD/WIIPA is considered an SRA (see Map 2.3).

Approximately 3.2% (34,141 acres) of the CD/WIIPA is spring/summer/fall mule deer range (Table 3.14). The 32,363 acres of spring/summer/fall range within the South Rock Springs portion of the CD/WIIPA represents 9.4% of this range type within the herd unit, whereas the 1,778 acres in the Steamboat herd represents 1.7% of spring/summer/fall range in that herd unit. The remaining 61,858 acres of mule deer range within the CD/WIIPA is yearlong range located entirely within the Chain Lakes herd unit (Table 3.14, Map 3.9). This yearlong range within the CD/WIIPA represents 34.3% of this range type in the Chain Lakes herd unit. Approximately 43.8% (464,294 acres) in the Red Desert and Great Divide Basin of the northern CD/WIIPA is unsuitable as mule deer range (see Map 3.8).

Existing roads within the CD/WIIPA (other than I-80) probably do not interfere with mule deer seasonal movement. Easterly et al. (1991) found that



Map 3.9 **Mule Deer Herd Units and Range Types, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.**

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roads associated with oil and gas fields in mule deer crucial winter range (central Wyoming) did not interfere with mule deer use of the area. However, occasionally heavy traffic along improved roads in the CD/WIIPA may preclude mule deer crossings for short periods of time. Although fences generally do not impede mule deer movement, deep snow and startling events (e.g., the rapid approach of a vehicle) can make fences a source of mortality. For example, fence kills accounted for 13% of 144 mule deer deaths caused by factors other than hunting and winterkill in the Ruby-Butte Deer herd in Nevada (Papez 1976). It is likely that the only fences within or immediately adjacent to the CD/WIIPA that substantially impede mule deer movements are those along I-80, which divides the Steamboat and Chain Lakes herds from the Baggs and South Rock Springs herds.

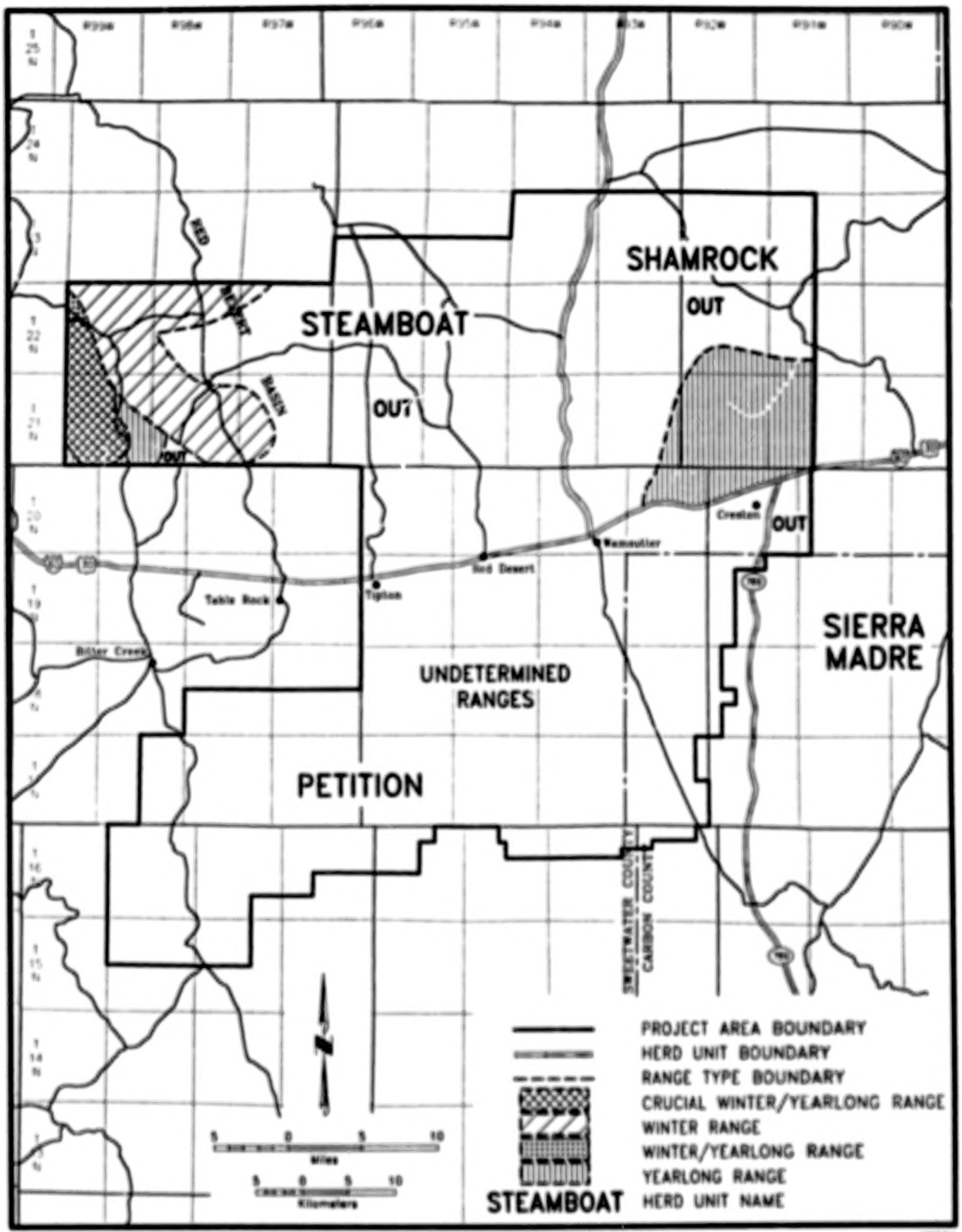
Elk. Elk occurring on the CD/WIIPA are part of four herd units--the Sierra Madre, Shamrock, Steamboat, and Petition herd units (Map 3.10). The Sierra Madre herd unit includes hunt area 108 on the CD/WIIPA and overlaps a small portion of the eastern CD/WIIPA south of I-80 and east of State Highway 789. The population objective for the herd is 4,200 animals, and the estimated 1996 end-of-year population was approximately 6,670 elk, or 159% of objective (Table 3.13). The 5-year population average is 6,605 animals, or 157% of objective.

The Shamrock herd unit includes hunt area 118 on the CD/WIIPA and encompasses the CD/WIIPA north of I-80 and east of the Wamsutter Road (see Map 3.10). The WGFD population objective for the Shamrock herd is 75 elk, and the 1996 end-of-year population was estimated at 117 animals (156% of objective) (Table 3.13). The 5-year population average for the herd was 122 elk, or 163% of objective.

The Steamboat herd unit includes elk hunt area 100 on the CD/WIIPA in the sagebrush desert habitat north of I-80 and west of the Wamsutter Road (see Map 3.10). The WGFD population objective is 500 animals and the estimated population at the end of 1996 was 660 animals, or 132% of objective (Table 3.13). The 5-year population average was 614 animals (123% of objective).

The Petition elk herd unit (hunt area 124) was recently established by the WGFD, and includes portions of the CD/WIIPA west of State Highway 789 and south of I-80 (see Map 3.10). The WGFD population objective for the herd is 200 animals, and the 1996 end-of-year population estimate was 270 elk, or 135% of objective (Table 3.13). Approximately 200 elk are known to winter in the Powder Rim area along the southern border of the herd unit. Twenty to 50 elk also winter in the area around Kinney Rim. Known summer ranges include East Draw, located west of Kinney Rim, and the Flat Tops area along State Highway 789 northwest of Baggs. The Powder Rim and Kinney Rim areas will likely be designated as crucial range for the Petition herd; however, boundaries for crucial winter and other range types have not yet been delineated (personal communication, Pat Hnilicka, Wildlife Biologist, WGFD, 1995).

Approximately 41.5% of the CD/WIIPA is defined by the WGFD as unsuitable as elk range (see Map 3.10). All of the area designated for the Sierra Madre elk herd on the CD/WIIPA is not suitable elk habitat, and the majority of the Steamboat and Shamrock herd units within the CD/WIIPA are also devoid of elk habitat (see Map 3.10). In addition, the majority of undefined range type for the Petition elk herd--481,837 acres or 45.4% of the CD/WIIPA--is likely unsuitable as elk habitat. Much of the available elk habitat within the CD/WIIPA is winter range occurring within the Steamboat herd unit. The 57,045 acres of elk winter range within the CD/WIIPA includes 5.4% of the project area and accounts for 26.6% of the winter range within the Steamboat herd unit (Table 3.14). Elk winter range is generally associated with foothills, rugged terrain, and washes located in sagebrush-grassland habitats (Lyon and Ward 1982). Crucial winter/yearlong range covers approximately 1.7% of the CD/WIIPA (18,116 acres) and represents 6.6% of the crucial winter/yearlong range for the Steamboat herd unit. Elk crucial winter range on the CD/WIIPA is considered a SRA (see Map 2.3). Yearlong elk range occurs within both the Shamrock and Steamboat herd units, and covers 5.9% of the CD/WIIPA (62,829 acres). The 56,619 acres of Shamrock herd unit yearlong range within the CD/WIIPA represents 29.4% of this range type for the herd unit; whereas the 6,210 acres of Steamboat herd unit yearlong range represents 10.9% of yearlong range for that herd unit. Winter/yearlong range within the CD/WIIPA (1,183 acres) is limited to the Steamboat herd and represents 0.5% of this type within the herd unit.



Map 3.10 Elk Herd Units and Range Types, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

3.2.2.2 Other Mammals

Based on observation records (WGFD 1995b; Wyoming Natural Diversity Database [WNDDB] 1995, 1996, 1997) and range and habitat preference (Clark and Stromberg 1987; WGFD 1992), 60 mammal species are known to occur or are likely to occur within or adjacent to the CD/WIIPA.

Predator species known to occur or potentially occurring in the area are coyote, swift fox, red fox, raccoon, ermine, long-tailed weasel, badger, western spotted skunk, striped skunk, mountain lion, and bobcat (Clark and Stromberg 1987; WGFD 1992).

Lagomorph species include desert cottontail, mountain (Nuttall's) cottontail, and white-tailed jackrabbit. Pygmy rabbits may also occur in the area (Clark and Stromberg 1987; WGFD 1992, 1995b; WNDDB 1995, 1996, 1997).

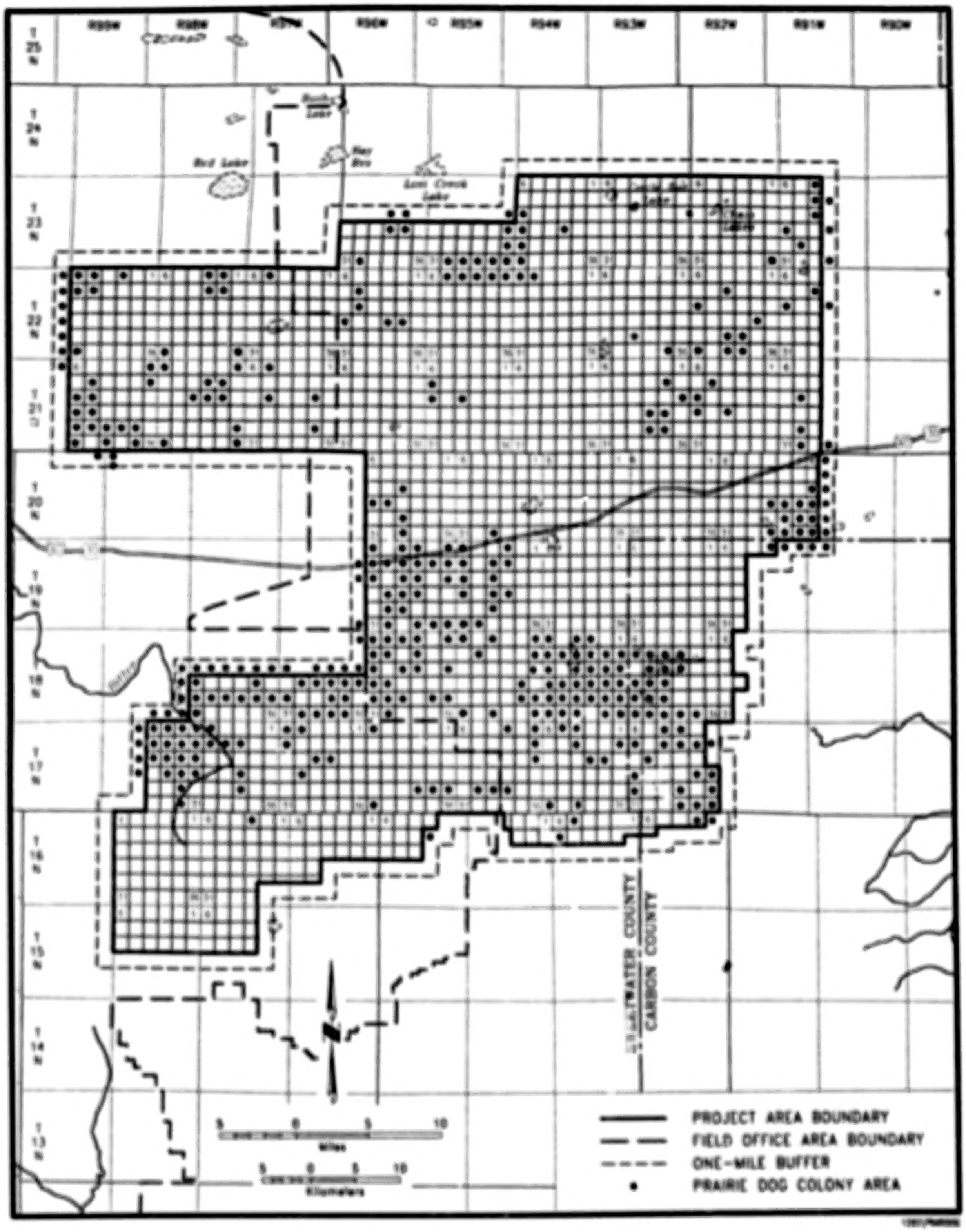
Squirrels known to occur or potentially occurring within the CD/WIIPA include least chipmunk, Wyoming ground squirrel, golden-mantled ground squirrel, thirteen-lined ground squirrel, and white-tailed prairie dog (Map 3.11) (Clark and Stromberg 1987; WGFD 1992, 1995b; WNDDB 1995, 1996, 1997). Other rodents include: two species of pocket gopher (Wyoming and northern), three species of pocket mouse (olive-backed, silky, and Great Basin), Ord's kangaroo rat, beaver, canyon mouse, white-footed mouse, deer mouse, pinon mouse, northern grasshopper mouse, bushy-tailed woodrat, four species of vole (long-tailed, montane, meadow, and sagebrush), muskrat, two species of jumping mouse (meadow and western), and porcupine. Several species of shrews (masked, Merriam's dusky, and dwarf) and bats (California, western small-footed, long-eared, little brown, long-legged myotis, hoary, silver-haired, big brown, Townsend's big-eared, and pallid) also may occur on the CD/WIIPA.

3.2.2.3 Raptors

All raptors and their nests are protected from take or disturbance under the *Migratory Bird Treaty Act* (16 U.S.C. 703-711) and Wyoming statutes (Wyoming Statute [W.S.] 23-1-101 and 23-3-108). Certain species are also afforded protection under the *Bald Eagle Protection Act* (16 U.S.C. 668-688d) and the *Endangered Species Act* (16 U.S.C. 1513-1543).

Raptor nesting surveys were conducted on portions of the CD/WIIPA and a 1.0-mi buffer during the 1992, 1994, 1995, and 1996 breeding seasons to provide information on the location and activity status of raptor nests. The entire CD/WIIPA was surveyed. A total of 684 nests are located on or around the CD/WIIPA, of which 33 were known to be active during 1994, 1995, or 1996 (Map 3.12). Inactive nests may be used in future years depending upon the needs of the raptors in the area. The majority (70%) of active nests were those of ferruginous hawks (23 nests). Other raptor species known to nest on or adjacent to the CD/WIIPA include prairie falcon (five active nests), golden eagle (two active nests), Swainson's hawk (two active nests), and great horned owl (one active nest). Ferruginous hawk nests also comprised the majority (77.0%) of inactive nests on or adjacent to the CD/WIIPA (501 nests). There were 69 inactive golden eagle nests, 29 inactive red-tailed hawk nests, five inactive Swainson's hawk nests, four inactive prairie falcon nests, and 43 inactive nests of unknown species.

Most raptor nests are located in topographically diverse areas of the CD/WIIPA; however, the entire CD/WIIPA (1,061,200 acres) is considered suitable habitat for raptor hunting, foraging, and perching (Table 3.14). The numerous rock outcrops and cliffs provide suitable substrates for raptor nesting, and the BLM has defined several raptor concentration areas (RCAs) for the RFO area that occur within and adjacent to the CD/WIIPA (BLM 1987a:205-207) (see Map 3.12). These RCAs contain nesting concentrations of ferruginous hawks, golden eagles, and/or prairie falcons. Portions of the Delaney Rim, Cherokee, and Muddy Creek RCAs are located within the CD/WIIPA. No RCAs have been defined for the RSFO area; however, concentrations of nesting raptors occur in the southwestern portion of the project area (BLM 1992a:434-436). Based on the results of recent raptor surveys on the CD/WIIPA, additional areas with relatively high densities of raptor nests have been delineated (see Map 3.12), and these areas, RCAs, and areas within 1.0 mi of known active raptor nests occupy 18.3% (194,400 acres) of the CD/WIIPA (Table 3.14) and are considered suitable raptor nesting habitat. RCAs and the newly delineated areas with relatively high raptor nest densities are considered SRAs (see Map 2.3).



Map 3.11 Sections with Current and/or Historic Prairie Dog Colonies, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

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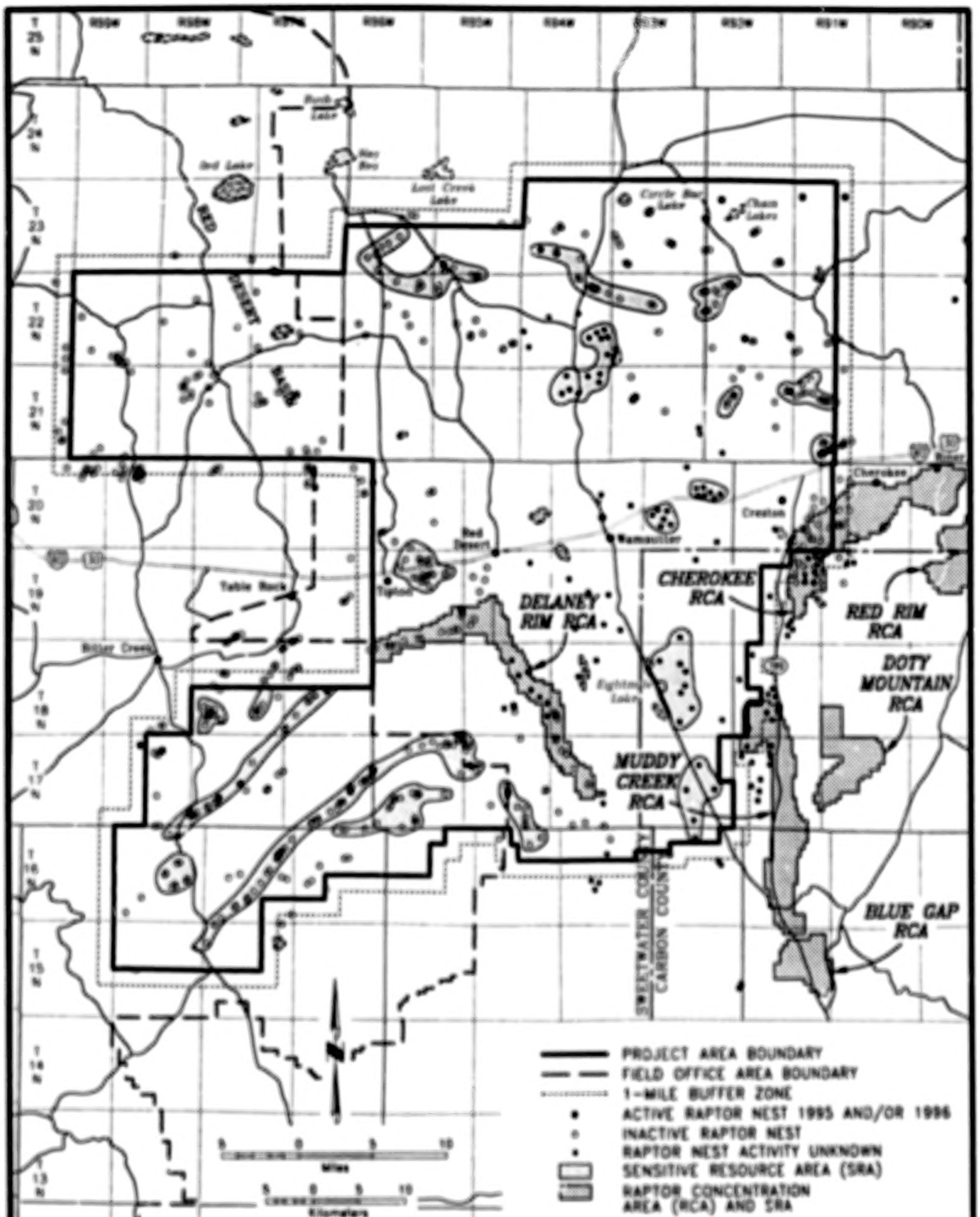


Map 3.12 Raptor Concentration Areas and Nest Locations, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Most of the raptor species known to breed in the CD/WIIPA migrate to more hospitable climates during winter. However, golden eagles and great horned owls may remain in the area throughout the year. Rough-legged hawks winter in the CD/WIIPA and move north to Canada for the breeding season (Scott 1987; WGFD 1992). Bald eagles have occasionally been observed foraging within the CD/WIIPA during winter months (WGFD 1995b). In addition to the raptor species known to nest on or adjacent to the CD/WIIPA, several other species may frequent the area during the summer months.

3.2.2.4 Upland Game Birds

Two upland game bird species, sage grouse and mourning dove, occur on and adjacent to the CD/WIIPA. Five upland game bird management areas (UGBMAs) overlap the CD/WIIPA: Eden, Flaming Gorge, Red Desert, Sierra Madre, and South Wamsutter (Map 3.13).

Sage Grouse. Sage grouse habitat is characterized by an interspersed mixture of sagebrush and grassland. In winter, sage grouse use tall dense stands of sagebrush that remain relatively exposed through deep snow (Greer n.d.); low sagebrush on windswept knolls are also used as feeding sites (Hupp and Braun 1989). During spring, sage grouse gather on breeding grounds (leks), which are characterized by open areas (e.g., meadows, low sagebrush zones) surrounded by denser sagebrush cover (Greer n.d.). Sage grouse often return year after year to these leks, although their exact location may vary from year to year.

Sixty-five lek locations have been identified on the CD/WIIPA and associated 2-mi buffer (see Map 3.13). Fifty-one (78.5%) of these leks are historic (active at least 1 of the past 5 years), and 14 were new leks located during surveys conducted in 1995 and 1996. Historic leks are concentrated in the northeast portion of the project area, whereas most of the newly located leks are in the southwest portion of the CD/WIIPA--an area where leks were previously unknown. Eighteen leks were determined to be active during 1995 or 1996 surveys--14 were new leks and four were historic leks.

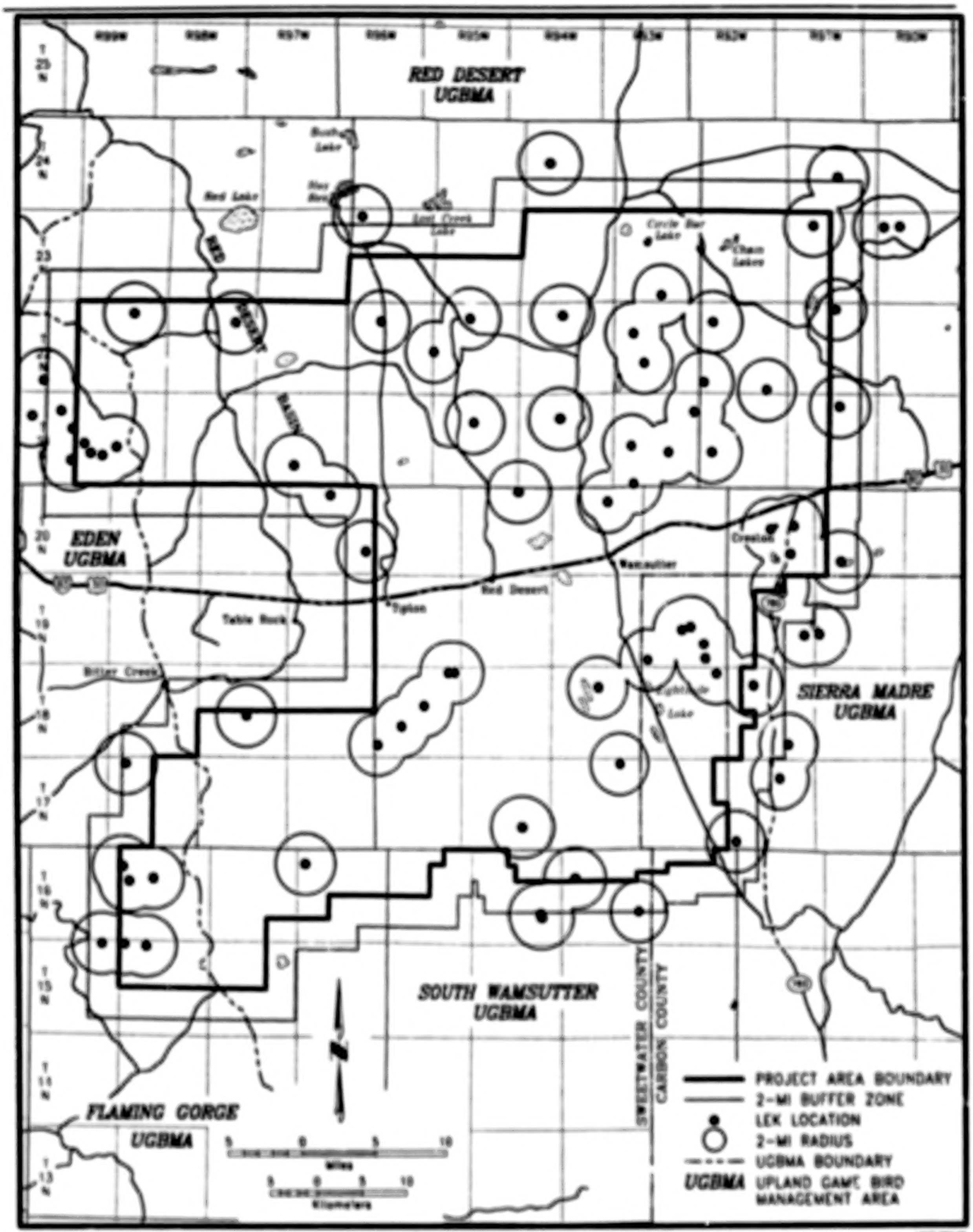
The area within 0.25 mi of a lek center is considered potential breeding habitat, and suitable grouse breeding habitat on BLM-managed land is protected from surface disturbance by a BLM surface disturbance stipulation (BLM 1987a:204). Sage grouse tend to nest within 2.0 mi of the lek center (BLM 1987a:202); therefore, this area is considered probable nesting habitat. Wallestad and Pyrah (1974) determined that 68% of sage grouse nests were within 1.5 mi of leks in central Montana. Braun et al. (1977) confirmed that the area within 2 mi of a lek often includes 60-80% of the nesting sage grouse from a lek. Sage grouse select sagebrush-grassland habitats with relatively tall sagebrush and canopy coverage ranging from approximately 10 to 40% in which to build nests (Wallestad and Pyrah 1974; Rothenmaier 1979).

Fifty-six active and/or historic sage grouse leks occur on or within 0.25 mi of the CD/WIIPA (see Map 3.13), and these leks and adjacent 0.25-mi buffer are considered optimal sage grouse breeding areas. Therefore, approximately 7,000 acres (0.7%) of the CD/WIIPA is considered potential sage grouse breeding habitat (Table 3.14). Approximately 54% of the potential sage grouse breeding habitat within the CD/WIIPA is located within the Red Desert UGBMA and 32% is located within the South Wamsutter UGBMA. Probable sage grouse nesting habitat (i.e., areas within 2 mi of known sage grouse leks) within the CD/WIIPA covers approximately 340,200 acres, or approximately 32.1% of the project area (Table 3.14). Fifty-two percent of this probable nesting habitat is in the Red Desert UGBMA.

Mourning Dove. The mourning dove is a common summer resident in habitats that occur in the CD/WIIPA. The species is highly adaptive, but prefers open land with scattered vegetation and requires trees or some type of structure for nesting. Mourning dove concentrations are usually highest near power lines, buildings, and other areas of human disturbance, and these areas are uncommon in the CD/WIIPA. Therefore, doves that do populate the CD/WIIPA likely utilize shrub-covered areas along washes and dunes that provide suitable cover for nesting and roosting.

3.2.2.5 Other Birds

Bird species potentially occurring within the CD/WIIPA, based upon range and habitat preference (Scott 1987; WGFD 1992) include common nighthawk, Say's phoebe, western kingbird, horned lark, swallows (e.g., violet-green, barn), black-billed magpie, common



Map 3.13 Sage Grouse Lek Sites and Upland Game Bird Management Areas, Continental Divide/ Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

raven, American crow, rock wren, mountain bluebird, loggerhead shrike, Brewer's sparrow, vesper sparrow, sage sparrow, lark bunting, McCown's longspur, red-winged blackbird, western meadowlark, Brewer's blackbird, common grackle, and brown-headed cowbird.

Several species of wading/shore birds and waterfowl occasionally occur along Antelope or Bitter Creek and within and around seasonal ponds/lakes within the CD/WIIPA. Wading/shore birds include such species as great blue heron, snowy egret, black-crowned night-heron, American avocet, killdeer, and spotted sandpiper. Waterfowl species include pied-billed grebe, American coot, Canada goose, mallard, green-winged teal, northern pintail, blue-winged teal, northern shoveler, gadwall, American wigeon, common merganser, and ruddy duck.

3.2.2.6 Amphibians and Reptiles

Based on range and habitat preference (Baxter and Stone 1985), two amphibian and five reptile species are likely to occur within the CD/WIIPA. Amphibian species include the tiger salamander and Great Basin spadefoot, which occur primarily in and adjacent to aquatic habitats. Reptile species include the sagebrush lizard, eastern short-horned lizard, Great Basin gopher snake, wandering garter snake, and prairie rattlesnake.

3.2.2.7 Fisheries

Perennial streams on the CD/WIIPA are limited to the Antelope and Bitter Creek drainages, which are Class 5 streams (WGFD 1991) and Class 4 surface waters (WDEQ 1990) (see Section 3.1.6.1). A WGFD Class 5 stream is considered a very low production water that is likely incapable of sustaining a trout fishery (WGFD 1991). Some fish species that potentially occur in Bitter Creek include redside shiner, speckled dace, and fathead minnow. The remaining streams, draws, and washes within the CD/WIIPA are ephemeral or intermittent and are not known to support permanent fish populations.

3.2.3 Wild Horses

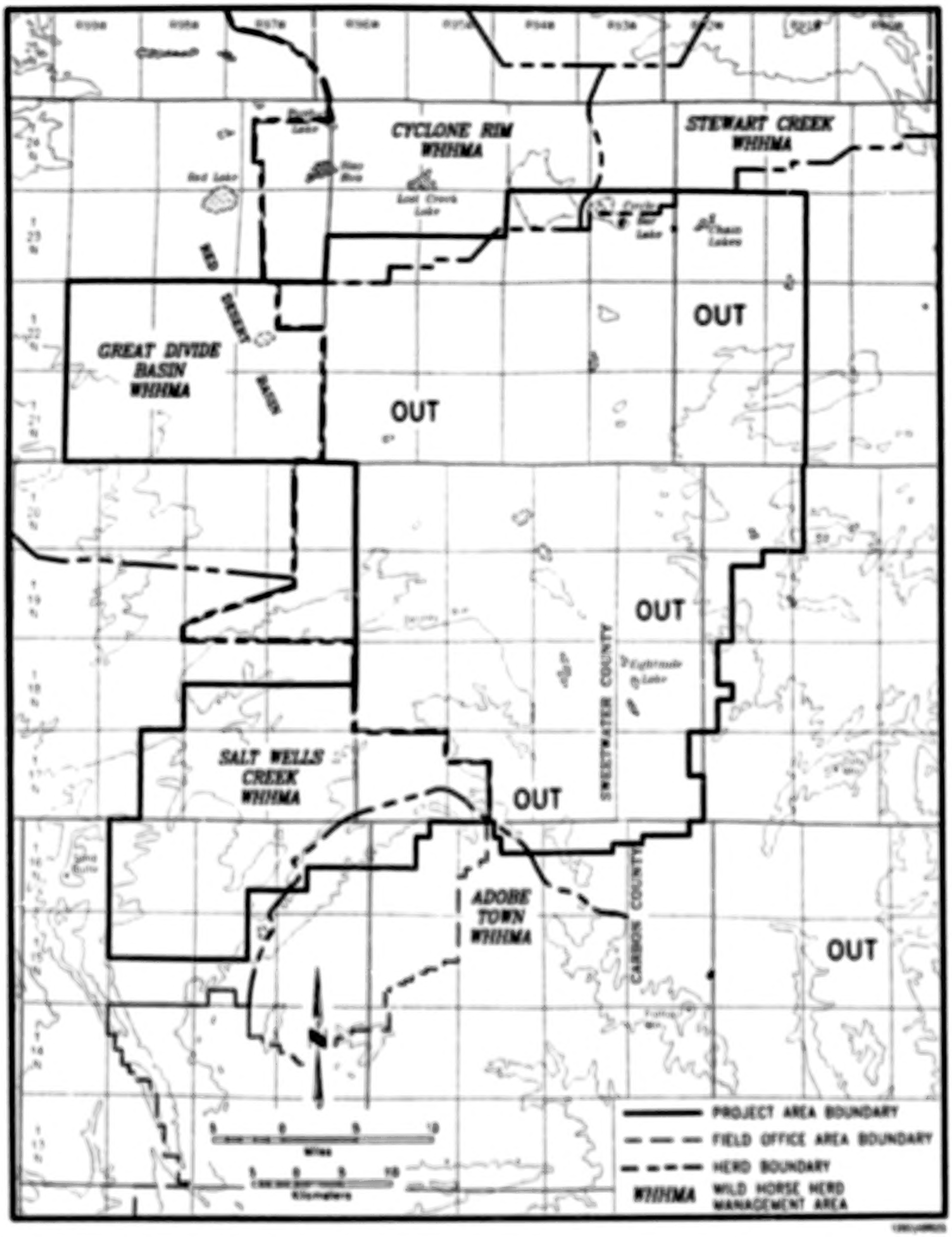
Portions of five Wild Horse Herd Management Areas (WHHMAs) (Cyclone Rim, Stewart Creek, Great Divide Basin, Salt Wells Creek, and Adobe Town) occur within the CD/WIIPA (Map 3.14). Wild horse population levels within the CD/WIIPA are highly variable since a major portion of the area is open range and wild horses often travel long distances. Central and eastern portions of the CD/WIIPA are outside of WHHMAs.

Approximately 5.8% (21,000 acres) of the 360,000-acre Cyclone Rim WHHMA occurs in the CD/WIIPA (2.0% of the CD/WIIPA) (BLM 1994b). Range conditions within the Cyclone Rim WHHMA are considered to be fair to good (personal communication, May 1995, with Mike Calton, BLM, Rawlins), and the appropriate management level is 70 (60-82) horses (BLM 1994b). A survey conducted in January 1998 found 385 horses in the Cyclone Rim WHHMA. The last gather in this area occurred in November 1996, when 140 horses were removed from the WHHMA.

The Stewart Creek WHHMA contains approximately 230,000 acres, of which about 4,000 acres (1.7%) are in the CD/WIIPA (0.4% of the CD/WIIPA) (BLM 1994b). Range conditions are considered to be fair to good (personal communication, May 1995, with Mike Calton, BLM Rawlins), and the appropriate management level is 150 (125-175) horses. An aerial survey conducted in January 1998 found 358 horses in the Stewart Creek WHHMA. One hundred thirty-eight horses were removed from the area in March 1997.

The 778,915-acre Great Divide Basin WHHMA (BLM 1992) includes 130,200 acres (16.7%) in the CD/WIIPA (12.3% of the CD/WIIPA). The appropriate management level is 500 horses with a range of 416-600, and the May 1995 population was about 570 (personal communication, May 1995, with Thor Stephenson, BLM). Thirty-seven horses have since been gathered. Range conditions within the Great Divide Basin WHHMA are considered fair to excellent.

The Salt Wells Creek WHHMA includes 1,193,283 acres (BLM 1992), of which 173,800 acres (14.6%) are in the CD/WIIPA (16.4% of the CD/WIIPA). The established appropriate management level is 365 horses, and the May 1995 population was about 747 (personal communication, May 1995, with Thor Stephenson, BLM). Four hundred fifteen horses have since been gathered during roundup operations.



Map 3.14 Wild Horse Herd Management Areas, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Range conditions within the Salt Wells Creek WHHMA are considered poor to good.

The Adobe Town WHHMA includes about 473,000 acres, of which 24,400 acres (5.2%) are in the CD/WIIPA (2.3% of the CD/WIIPA). The established appropriate management level is 700 horses with a range of 610-800 (BLM 1994b). In January 1998, the population was 879 (personal communication, June 1998, with Mike Calton, BLM, Rawlins). During the summer of 1997, 431 horses were removed from the Adobe Town WHHMA. Range conditions within the Adobe Town WHHMA are considered fair to good.

Although not a limiting factor to population growth, limited water availability in the CD/WIIPA restricts the distribution of horses, especially those within the Great Divide Basin WHHMA. This is true during all seasons except winter, when the availability of snow allows wider distribution. Wild horses may travel 10-12 mi/day for water.

3.2.4 Threatened, Endangered, Candidate, Special Status, and State Sensitive Species

The USFWS was contacted to initiate informal consultation and obtain a list of T&E and candidate species potentially present in the CD/WIIPA (personal communication, May 1995 and July 1997, with Mr. Charles Davis, Field Supervisor, and Ms. Mary Jennings, Acting Field Supervisor, USFWS). In addition, observation records of T&E, candidate species, special status species, and state sensitive species were requested from the WGFD (WGFD 1995b) and the WNDDB (WNDDB 1995, 1996, 1997) for areas within and adjacent to the CD/WIIPA.

3.2.4.1 Federal Threatened, Endangered, Candidate, and Special Status Species

The *Endangered Species Act* (16 U.S.C. 1531-1543) protects listed T&E plant and animal species and their critical habitats. To ensure compliance with this act, a BA analyzing the potential effects of the proposed project on T&E, candidate species, and special status species has been prepared and included as part of this EIS (Appendix E). Additional data on T&E, candidate, and special status species would be collected throughout the LOP during surveys conducted on a case-by-case basis as directed by the BLM as components of the ROW application and APD processes.

T&E, candidate species, and special status species are those that have been specifically designated as such by the USFWS and/or BLM. Endangered species are those that are in danger of extinction throughout all or a significant portion of their ranges. Threatened species are those that are likely to become endangered in the foreseeable future throughout all or a significant portion of their ranges. Candidate species (formerly category 1 candidate species) are those for which the USFWS has sufficient data to list as threatened or endangered, but for which proposed rules have not yet been issued. Special status species (formerly category 2 candidate species) are those that may warrant designation as candidate species but sufficient data are not currently available for such a designation decision; these species may be referred to as "species at risk" by the USFWS.

T&E animal species potentially occurring on the CD/WIIPA are black-footed ferret (endangered), bald eagle (threatened), and peregrine falcon (endangered). In addition, swift fox and mountain plover are candidate (proposed threatened) animal species potentially occurring in the CD/WIIPA. Special status animal species most likely to occur on the CD/WIIPA are ferruginous hawk, burrowing owl, loggerhead shrike, and eastern short-horned lizard. Additional special status animal species potentially occurring in the CD/WIIPA are long-eared myotis, long-legged myotis, pale Townsend's big-eared bat, pygmy rabbit, small-footed myotis, black tern, Columbian sharp-tailed grouse, northern goshawk, and trumpeter swan. Four T&E fish species (bonytail chub, Colorado squawfish, humpback chub, and razorback sucker) occur downstream of the CD/WIIPA in portions of the Little Snake and Colorado River drainages. Two additional special status species (flannelmouth sucker and roundtail chub) also occur in these drainages.

One federally listed plant species, the threatened Ute ladies' tresses, may occur in the project area. While this species is not known from south-central Wyoming, its occurrence in eastern Wyoming, central Colorado, and northeastern Utah suggests that it may be present in the area. Five special status plant species likely occur within the CD/WIIPA: Cedar Rim thistle, large-fruited bladderpod, opal phlox, smooth goosefoot, and mystery wormwood. Although unlikely, six additional special status plant species (Big Piney milkvetch, tufted twinpod, Devil's Gate twinpod, Gibben's beardtongue, Ownbey's thistle, and Wyoming tansymustard) may also occur in habitats within the area.

A complete description of the current status, habitat use and preference, and potential occurrence within the CD/WIIPA for all T&E, candidate, and special status species is presented in the BA (Appendix E).

3.2.4.2 State Sensitive Species

Mammals. Seven state sensitive mammal species potentially occur within and/or adjacent to the CD/WIIPA: dwarf shrew, eastern red bat, hoary bat, pinon mouse, silky pocket mouse, white-footed mouse, and Wyoming pocket gopher (Table 3.15). Of these, dwarf shrew, silky pocket mouse, white-footed mouse, and Wyoming pocket gopher have been observed within or immediately adjacent to the CD/WIIPA according to WGFD (1995b) and WNDDB (1995, 1996, 1997) records.

Although the dwarf shrew generally inhabits forest and alpine habitats at higher elevations, it is occasionally found in arid habitats such as short-grass prairie and pinyon-juniper woodlands at lower elevations (Clark and Stromberg 1987; WGFD 1992). This shrew species occurs in isolated populations in Wyoming where suitable relict habitat is available (Clark and Stromberg 1987). A dwarf shrew was observed in the southeastern corner of the CD/WIIPA in August 1980 (WNDDB 1995).

The silky pocket mouse inhabits the grasslands, deserts, and juniper woodlands of eastern and southern Wyoming and are most abundant in areas with loose and friable soils (Clark and Stromberg 1987; WGFD 1992). In south-central Wyoming, observations of this species have been associated with grasslands containing sagebrush and rabbitbrush (WGFD 1995b). A single silky pocket mouse was observed in August 1981 at a location approximately 1 mi east of the CD/WIIPA (WGFD 1995b).

Two white-footed mice were observed in separate locations within 2 mi of the eastern CD/WIIPA in August 1981 (WGFD 1995b). This species generally occurs east of the Rocky Mountains (Burt and Grossenheider 1976; Clark and Stromberg 1987) and is at the western extreme of its range in central Wyoming (WGFD 1992). White-footed mice inhabit deciduous woodlands and associated riparian habitats (Clark and Stromberg 1987). It is possible, given the difficulty in distinguishing between the various species of *Peromyscus*, that the individuals observed east of the CD/WIIPA were incorrectly identified as white-footed mice. If white-footed mice occur in the CD/WIIPA, it is likely they are very limited in their distribution due to their preference for riparian areas; little of this habitat type occurs within the CD/WIIPA.

The Wyoming pocket gopher was collected from the southern portion of the CD/WIIPA in 1976 (Thealer and Hinesley 1979). The species inhabits loose rocky soils, greasewood communities, and dry hill tops, usually feeding underground by pulling vegetation and roots downward. Wyoming observations are reported only in the south-central portion of the state (WGFD 1992).

Birds. Seventeen state sensitive bird species have been observed within and adjacent to the CD/WIIPA (Table 3.15). Nine of these species are associated with aquatic habitats: American bittern, American white pelican, black-crowned night-heron, caspian tern, common loon, Forster's tern, great blue heron, snowy egret, and western grebe. Of these, only the American bittern, black-crowned night-heron, great blue heron, and western grebe likely use the limited riparian areas within and adjacent to the CD/WIIPA on more than an occasional basis (e.g., as a migratory stopover for short-term foraging). These four species probably summer in areas within and adjacent to the CD/WIIPA and may nest in the area on occasion.

Of the eight upland bird species observed either within or adjacent to the CD/WIIPA, six species have been observed almost exclusively in the juniper woodland habitats south of the CD/WIIPA along the Colorado-Wyoming border: ash-throated flycatcher, bushtit, Lewis' woodpecker, plain titmouse, Scott's oriole, and scrub jay. These species would, for the most part, be rare visitors to the CD/WIIPA.

Merlins, small members of the falcon family, have been observed flying through sagebrush-grassland habitats adjacent to the CD/WIIPA (WGFD 1995b). On occasion, this species probably forages within the

Table 3.15 Wyoming Game and Fish Priority Animal Species, Wyoming Natural Diversity Database Status, and Their Potential Occurrence on the CD/WIIPA, Sweetwater and Carbon Counties, Wyoming.[1]

Common Name	Scientific Name	WGFD Status[2]	WNDDB Status[3]	Potential Occurrence on CD/WIIPA[4]
MAMMALS				
Dwarf shrew	*Sorex nanus*	II-WGFD	S3, G5	U
Eastern red bat	*Lasiurus borealis*	III-WGFD	S4, G5	R
Hoary bat	*Lasiurus cinereus*	III-WGFD	S4, G5	R
Pinon mouse	*Peromyscus truei*	III-WGFD	S4, G5	X
Silky pocket mouse	*Perognathus flavus*	III-WGFD	S4, G5	U
White-footed mouse	*Peromyscus leucopus*	III-WGFD	S4, G5	U
Wyoming pocket gopher	*Thomomys clusius*	--	S2, G2	U
BIRDS				
American bittern	*Botaurus lentiginosus*	II-WGFD	S3B/S4N, G4	U
American white pelican	*Pelecanus erythrorhynchos*	I-WGFD	S1B/S3N, G3	R
Ash-throated flycatcher	*Myiarchus cinerascens*	III-WGFD	S5B/S5N, G5	U
Black-crowned night-heron	*Nycticorax nycticorax*	I-WGFD	S2B/S4N, G5	U
Bushtit	*Psaltriparus minimus*	III-WGFD	S5B/S5N, G5	R
Caspian tern	*Sterna caspia*	I-WGFD	S1B/S4N, G5	R
Common loon	*Gavia immer*	I-WGFD	S2B/S4N, G5	R
Forster's tern	*Sterna forsteri*	I-WGFD	S1B/S3N, G5	R
Great blue heron	*Ardea herodias*	III-WGFD	S3B/S5N, G5	C
Lewis' woodpecker	*Melanerpes lewis*	III-WGFD	S3B/SZN, G4	R
Long-billed curlew	*Numenius americanus*	III-WGFD	S3B/S4N, G5	U
Merlin	*Falco columbarius*	II-WGFD	S2B/SZN, G4	U
Plain titmouse	*Parus inornatus*	III-WGFD	S5B/S5N, G5	R
Scott's oriole	*Icterus parisorum*	III-WGFD	S2B/S5N, G5	R
Scrub jay	*Aphelocoma coerulescens*	III-WGFD	S5B/S5N, G5	R
Snowy egret	*Egretta thula*	I-WGFD	S1B/S4N, G5	R
Western grebe	*Aechmophorus occidentalis*	II-WGFD	S2B/S5N, G5	U

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[1] Adapted from Wyoming Game and Fish Department (1992, 1995b) and Wyoming Natural Diversity Database (1995, 1996, 1997).

[2] **Wyoming Game and Fish Department Status:**

I-WGFD = Priority I; includes species in need of immediate attention and active management to ensure that extirpation or a significant decline in the breeding population does not occur.

II-WGFD = Priority II; includes species in need of additional study to determine whether intensive management is warranted or whether low-level management (such as monitoring population trends) will suffice. Until intensive management is necessary, low-level management will be implemented.

III-WGFD = Priority III; includes species that should be accommodated in resource management planning. However, intensive management programs to maintain or enhance populations are not warranted at present. Populations of these species should be monitored to determine if low levels of management continue to be adequate. Knowledge of some of these species is often very limited.

[3] **Wyoming Natural Diversity Database Status:**

S1 = Species critically imperiled in the state because of extreme rarity (five or fewer occurrences or very few remaining individuals) or because of some factor(s) making it especially vulnerable to extirpation within the state.

S1B = Statewide breeding status of S1.

S2 = Species imperiled in the state because of rarity (6 to 20 occurrences or few remaining individuals) or because of some factor(s) making it very vulnerable to extirpation within the state.

S2B = Statewide breeding status of S2.

S3 = Species rare or uncommon in the state (on the order of 21 to 100 occurrences).

S3B = Statewide breeding status of S3.

S3N = Statewide nonbreeding status of S3.

S4 = Species apparently secure in the state with many occurrences.

S4N = Statewide nonbreeding status of S4.

S5 = Species demonstrably secure in the state and essentially ineradicable under present conditions.

S5B = Statewide breeding status of S5.

S5N = Statewide nonbreeding status of S5.

SZN = Species that are not of significant concern when migrating through, or wintering in, Wyoming. This includes relatively uncommon migrants in the state with irregular, transitory, or dispersed occurrences. Includes rare species for which important habitats that could be protected are difficult or impossible to define. Also refers to abundant species wintering in, or migrating through, Wyoming.

G2 = Species imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals) or because of some factor(s) making it very vulnerable to extinction throughout its range.

G3 = Species very rare and local throughout its range, found locally (even abundant at some locations) in a restricted range, or vulnerable to extinction throughout its range.

G4 = Species apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.

G5 = Species demonstrably secure globally and essentially ineradicable under present conditions.

[4] **Potential Occurrence On CD/WIIPA:**

C = Locally common; species could occur in abundant numbers, but only in widely scattered or isolated populations. Populations of individuals probably will be encountered during construction and field operation, but only at a limited number of sites. Species could be present for a significant part of a year (e.g., breeding season, summer resident) or the entire year.

U = Uncommon; species may be present in the project area, but in such low numbers or in such small and widely scattered populations that an encounter during construction and field operation is unlikely. The species could be present for a significant part of the year (e.g., breeding season, summer resident) or the entire year.

R = Rare; species may be in impact area for just a few days or hours (e.g., stopping over during migration), or the species has only occasionally or rarely been sighted in the project area. Encounters during construction and field operation are very unlikely.

X = Not probable; there has been no recent historical record of the species' occurrence in the project area; probability of encountering the species during construction and field operation is extremely unlikely.

CD/WIIPA for short periods of time. It is unlikely that merlins nest within the area given the lack of deciduous or coniferous trees within the CD/WIIPA. These falcons tend to select old magpie nests in trees as nest sites (WGFD 1992).

Long-billed curlews breed in arid grasslands and sagebrush/grasslands of the western Great Plains and Great Basin (Howe 1983). They arrive in the central Rocky Mountains in April (Behle and Perry 1975) and build shallow scrape nests in open areas of short-grass prairie (Allen 1980). In May 1985, a long-billed curlew was observed along a roadside in the southwest portion of the CD/WIIPA (WGFD 1995b). Five other observations of curlews have been recorded in the region surrounding the CD/WIIPA; one bird west of the CD/WIIPA was engaged in courtship behavior (WGFD 1995b). It is likely that long-billed curlews occasionally use areas within the CD/WIIPA for foraging or as stopover areas during migration, but probably remain in the area for only short periods of time. Although unlikely, curlews may use areas within the CD/WIIPA for nesting; mixed grass prairie and other grassland habitats do occur within the area.

Plants. Thirty-one species of plants considered state sensitive by the WNDDB potentially occur in the CD/WIIPA and surrounding areas. Table 3.16 presents these species, along with their WNDDB status, habitat characteristics, and probability of occurrence within the CD/WIIPA.

Although any of the 31 plant species listed in Table 3.16 could occur within the CD/WIIPA, only five species (16%) have been observed within the CD/WIIPA: *Astragalus nelsonianus, Erigeron uintahensis, Phacelia tetramera, Scirpus nevadensis*, and *Senecio spartioides* var. *multicapitatus* (WNDDB 1995, 1996, 1997). *Astragalus nelsonianus*, or Nelson's milkvetch, is a perennial forb that favors desert hills with sandy or clayey soils (Dorn 1992). This species has been observed in the west-central and southeastern portions of the CD/WIIPA in dry meadows and along rims (WNDDB 1995). *Erigeron uintahensis* (Uintah fleabane) is a perennial forb usually associated with moist woods and meadows (Dorn 1992). This fleabane has been observed in the central CD/WIIPA along the upper north slope of Delaney Rim in pockets of chokecherry and serviceberry (WNDDB 1995; personal communication, March 1996, with Walt Fertig, Botanist, WNDDB). The tiny phacelia (*Phacelia tetramera*) is an annual forb that prefers sandy desert and dunal areas (Dorn 1992). A tiny phacelia was observed in the southern CD/WIIPA on the east side of a sand dune; the plants were located beneath and around big sagebrush. *Scirpus nevadensis*, or Nevada bulrush, is found in wet areas of alkaline mud flats (Dorn 1992). In 1974, this grass-like plant was observed in such a habitat in the northeastern CD/WIIPA (WNDDB 1995). *Senecio spartioides* var. *multicapitatus* (many-headed broom groundsel) is a perennial forb that grows on dunes and sandy slopes in Sweetwater and Carbon Counties (Dorn 1992). This species has been observed in such habitat along the southern border of the CD/WIIPA.

Of the remaining sensitive plant species, 12 (39%) possibly occur within the CD/WIIPA and 14 (45%) are unlikely to occur in the area (Table 3.16).

3.3 CULTURAL RESOURCES

The following sections present a general cultural resources overview of the CD/WIIPA and are adapted from the more-detailed overview and analysis of the archaeological record and prehistory of the area presented in the cultural resources technical support document prepared for this project (BLM 1998d).

3.3.1 Previous Investigations

Existing records contain information from an estimated one thousand cultural resource projects in the vicinity of the CD/WIIPA. The vast majority of these projects are Class III cultural resource inventories conducted in association with oil and gas development. Several large Class II inventories have also examined portions of the area. As of 1995, a cumulative total of over 100,000 acres had been inventoried comprising a maximum of approximately 9% of the total CD/WIIPA. However, the total portion of the CD/WIIPA inventoried is probably considerably less due to overlap in areas examined during different projects. As of 1995, a total of 2,718 archaeological sites had been recorded in the area, consisting of 2,459 prehistoric sites, 226 historic sites, and 33 sites with both prehistoric and historic components.

Table 3.16 Wyoming Natural Diversity Database Plant Species of Concern and Their Status and Potential Occurrence on the CD/WIIPA, Sweetwater and Carbon Counties, Wyoming.[1]

Scientific Name	Common Name	Status[2]	Habitat	Probability of Occurrence[3]
Androstephium breviflorum	Purple funnel-lily	S1, G5, SR LIST	Dry hills with sandy or clayey soils, associated with sagebrush-greasewood (*Artemisia-Sarcobatus*) and juniper (*Juniperus*) vegetation types; Carbon and Sweetwater Counties	Possible
Arabis crandallii	Crandall's rock cress	S1, G4, SR LIST	Desert hills and sandstone outcrops, associated with sagebrush scrub vegetation type; Carbon and Sweetwater Counties	Possible
Arabis pulchra var. *pallens*	Beautiful rock cress	S1, G5T5, SR LIST	Desert hills and sandy slopes; sometimes associated with greasewood habitat near seeps or springs; Carbon and Sweetwater Counties	Unlikely
Arabis selbyi	Selby rock cress	S1, G4?Q, SR LIST	Desert hills and sandstone outcrops; Sweetwater County	Unlikely
Astragalus kentrophyta var. *elatus*	Spinyleaf milkvetch	S1, G5T4, SR LIST	Desert hills; Sweetwater County	Possible
Astragalus nelsonianus	Nelson's milkvetch	S2, G3, LD LIST	Desert hills with sandy, pebbly, or clayey soils; often in draws or dry meadows; Fremont, Natrona, and Sweetwater Counties	Likely
Calyptridium roseum	Rosey pussy-paws	G5, S1	Big sagebrush vegetation communities; Carbon, Fremont, and Sublette Counties	Possible
Carex parryana var. *parryana*	Parry sedge	S1, G4T4, SR LIST	Moist soil with volcanic cinders and sand substrate, associated with shooting star (*Dodecatheon*); Carbon, Crook, and Sweetwater Counties	Possible
Chaenactis stevioides	Desert dustmaiden	S1, G4, SR LIST	Sandy desert areas, 6,000-6,800 ft; often associated with greasewood and hopsage (*Grayia*) communities; Carbon and Sweetwater Counties	Possible
Chenopodium subglabrum	Smooth goosefoot	S2, G3, LD LIST	Along streams through sand dunes; associated with mentzelia (*Mentzelia*) and groundsmoke (*Hayophytum*); Carbon County	Unlikely
Chrysothamnus greenei	Greene rabbitbrush	S1, G5, SR LIST	Rocky desert flats; Sweetwater County	Unlikely
Cryptantha scoparia	Desert cryptantha	S1, G3, SR LIST	Desert hills and sagebrush-covered slopes; Lincoln, Sublette, and Sweetwater Counties	Unlikely
Cryptantha stricta	Erect cryptantha	S2, G3, LD LIST	Rocky slopes in desert and foothill areas; Carbon, Fremont, Natrona, Sweetwater, and Uinta Counties	Unlikely
Descurainia pinnata var. *paysonii*	Payson's tansymustard	S1, G5T3?, SR LIST	Sparsely vegetated shifting sand dunes; Sweetwater County	Unlikely
Erigeron consimilis	San Rafael daisy	S2, G3, LD LIST	Juniper forest and adjacent sagebrush areas; Sweetwater County	Unlikely
Erigeron uintahensis	Uintah fleabane	S1, G4, SR LIST	Woods, slopes, and grassy meadows, sometimes associated with chokecherry (*Prunus virginiana*) and serviceberry (*Amelanchier alnifolia*); Sweetwater and Uinta Counties	Likely

Table 3.16 (Continued)

Scientific Name	Common Name	Status[2]	Habitat	Probability of Occurrence[3]
Eriogonum divaricatum	Divergent wild buckwheat	G4G5/S1	Big sagebrush (*Artemisia tridentata*) and saltbush (*Atriplex*) vegetation communities; Sublette, Uinta, and Sweetwater Counties	Possible
Galium coloradoense	Colorado bedstraw	S1, G3G4, SR LIST	Desert hills and rocky areas, often associated with sagebrush; Sweetwater County	Unlikely
Ipomopsis crebrifolia	Compact gilia	S2S3, G3, LD LIST	Clay and shale slopes in rocky areas, often associated with sagebrush; Fremont, Lincoln, Sublette, Sweetwater, and Teton Counties	Possible
Malacothrix torreyi	Torrey's desert dandelion	S1, G4, SR LIST	Sandy flats and dunes; Bighorn, Park, and Sweetwater Counties	Possible
Monolepis pusilla	Red poverty-weed	S1, G5, SR LIST	Dry alkaline areas; Sweetwater and Washakie Counties	Possible
Penstemon pachyphyllus var. *mucronatus*	Sheep Creek beardtongue	S2, G4T4, LD LIST	Barren hills and slopes in juniper habitat; Carbon and Sweetwater Counties	Unlikely
Phacelia demissa	Intermountain phacelia	S1, G5, SR LIST	Barren hills, and clay slopes and flats; Fremont and Sweetwater Counties	Unlikely
Phacelia incana	Western phacelia	S1, G3G4, SR LIST	Desert hills; Carbon and Sweetwater Counties	Unlikely
Phacelia salina	Nelson phacelia	S1, G3Q, SR LIST	Barren clay hills; Lincoln, Sublette, and Sweetwater Counties	Possible
Phacelia tetramera	Tiny phacelia	S1, G4, SR LIST	Sandy desert and dunes, often around the base of big sagebrush; Fremont and Sweetwater Counties	Likely
Populus deltoides ssp. *wislizenii*	Fremont cottonwood	S1, G5T4, SR LIST	Dry washes and floodplains; Carbon and Sweetwater Counties	Unlikely
Sambucus cerulea	Blue elderberry	S1, G5?, SR LIST	Woods (e.g., aspen [*Populus tremuloides*] stands), thickets, and slopes; Sheridan and Sweetwater Counties	Possible
Scirpus nevadensis	Nevada bulrush	S1, G4, SR LIST	Alkaline/saline mud flats in wet areas; Albany, Carbon, Fremont, and Sweetwater Counties	Likely
Senecio spartioides var. *multicapitatus*	Many-headed broom groundsel	S1, G5T4, SR LIST	Dunes and sandy slopes; Carbon and Sweetwater Counties	Likely
Stipa nevadensis	Nevada needlegrass	S1, G4, SR LIST	Partially vegetated rocky rimrock with low sagebrush and grasses on sandy soils with granite boulders; Fremont County	Unlikely

Table 3.16 (Continued)

[a] Source: Dorn (1992), Fertig (1996), Fertig et al. (1994), and WNDDB (1995, 1996, 1997).

[b] **Wyoming Natural Diversity Database Status:**

State Rank/Definition

S1 = Critically imperiled in Wyoming because of extreme rarity (five or fewer extant occurrences, or very few remaining individuals), or because of some factor of a species' life history that makes it especially vulnerable to extinction.

S2 = Imperiled in Wyoming because of rarity (six to 20 occurrences), or because of factors making a species vulnerable to extinction.

S3 = Rare or local throughout its range in Wyoming or found locally in a restricted range (21 to 100 occurrences).

Global Rank/Definition

G3 = Rare or local throughout its global range or found locally in a restricted range (21 to 100 occurrences).

G4 = Apparently secure globally, although it may be quite rare in parts of its range, especially at the periphery.

G5 = Demonstrably secure globally, although it may be quite rare in parts of its range, especially at the periphery.

Other Codes

T = Trinomial rank; based on the rangewide status of a subspecific taxon (subspecies or variety); appended to the global rank for the full species.

Q = Questions exist regarding the taxonomic validity of a species, subspecies, or variety.

? = Questions exist regarding the assigned G, T, or S rank of a taxon.

Wyoming Natural Diversity Data Base Lists

LD LIST = Limited Distribution; species on this list have a restricted global range but may be locally abundant in suitable habitats within that range. Species on this list may be rare at a global scale, but are often relatively secure in Wyoming.

SR LIST = State Rare; this list contains species that are often extremely uncommon in Wyoming but which may be abundant or widespread outside of the state. These species may serve as indicators of unusual habitats or areas of high biodiversity.

[c] **Probability of occurrence on the CD/WIIPA:**

Likely = Species has been observed within the CD/WIIPA according to WNDDB records (WNDDB 1995, 1996, 1997).

Possible = Species has been observed in the vicinity of the CD/WIIPA according to WNDDB records (WNDDB 1995, 1996, 1997), and potential habitat occurs within the CD/WIIPA.

Unlikely = Species has been observed in areas greater than 10 mi from the CD/WIIPA or has not been observed in the region according to WNDDB records (WNDDB 1995, 1996, 1997); potential habitat may occur within the CD/WIIPA.

3.3.1.1 Cultural Resource Inventories

The entire CD/WIIPA south of I-80 was included within the sampling areas for the Overland Planning Unit and Salt Wells Resource Area Class II inventories conducted in 1979 and 1980 (BLM 1984; Treat and Tanner 1981). The CD/WIIPA also encompasses the Red Desert and Creston-Cherokee Tracts examined during the Southwestern Wyoming (Sweetwater-Kemmerer and Hanna-Atlantic Rim) Coal Area EIS Class II inventory in 1977 (Metcalf 1977). The Class II inventories were undertaken to obtain baseline data concerning the distributions, densities, and types of sites present in the region. The results of these investigations with regard to the CD/WIIPA are discussed below.

Class III inventory coverage has been uneven across the CD/WIIPA. The majority of the inventories within the area were completed in conjunction with oil and gas development in the Wamsutter area and along utility corridors paralleling I-80. The area southeast and east of Wamsutter has been extensively inventoried, particularly the Amoco Echo Springs and Standard Draw oil and gas field units, and a moderate number of inventories have been conducted in The Haystacks Flat/Laney Wash/Adobe Town area. By contrast, comparatively few inventories covering limited acreage have been conducted in the northwestern and northern portions of the area.

The quality of previous Class III inventories has also been variable. Recent inventories conducted in accordance with current standards have indicated that much of the pre-1982 fieldwork is unreliable. The earliest inventories generally identified much lower site densities than more recent inventories, and recent attempts to relocate sites recorded during the Amoco Wamsutter block survey of 1980-1981 suggest that the site location data associated with the pre-1982 projects may be inaccurate. Site recordation and evaluation standards also have changed considerably since 1982, and the data recorded for most sites prior to 1982 (which includes the majority of the recorded sites in the area) is considered inadequate by current standards. Nevertheless, pre-1982 projects have resulted in the accumulation of an extensive body of potentially valuable information concerning prehistoric site types and distributions.

3.3.1.2 Archaeological Excavations

Test excavations have been conducted at numerous prehistoric sites within the CD/WIIPA in conjunction with Class III inventories. The testing data is typically reported in Class III inventory reports, and as a result, it is scattered throughout numerous reports, making it largely inaccessible for more general studies. Data in these reports include radiocarbon age estimates (as indicated by references in radiocarbon date compendia for the region) and data concerning associated cultural remains and environmental and geomorphological setting. Exceptions to this pattern include reports from several major testing projects, including the Colorado Interstate Gas (CIG) Trailblazer Pipeline testing report (Creasman et al. 1983) and the recent testing report for Site 48CR5511 (Murray et al. 1995). Other reports with notable feature testing data include the Echo Springs and Eightmile Lake Road inventory and testing reports (Schoen 1981; Stilphen 1981) and the Echo Springs site (Site 48CR1681) testing report (Archaeological Services 1982).

Salvage and block excavations conducted in conjunction with major construction projects also have been completed at a number of prehistoric sites within and adjacent to the CD/WIIPA. These projects generally focused on the excavation of basin features and stained lenses identified during construction monitoring in pipeline trench walls or on bladed ROW surfaces. The fieldwork for most of these investigations were completed prior to 1982. Excavated areas varied from 1- to 4-m^2 units and 8- to 18-m^2 small excavation blocks to larger excavation blocks ranging in size from 32 to 50 m^2. These projects resulted in the recovery of more significant bodies of data, including radiocarbon age estimates and information concerning feature and artifact types, subsistence patterns, depositional contexts, and paleoenvironments.

The salvage and small block excavation reports provide the primary source of data concerning the prehistoric use of the CD/WIIPA. The reports include the Amoco Wamsutter Liquid Condensate Collection System Project (Sender et al. 1982), the Cities Service Adobe Town Gas Pipeline Lateral (Latady 1984), the MAPCO Wamsutter Extension Pipeline (O'Brien et al. 1983), the Trailblazer Pipeline (Creasman et al. 1983), and the Jawbone Ranch No. 1 site (Site 48SW1643) (Hilman 1979). Notable data recovery block excavations also were undertaken at Site 48SW1135 just south of the CD/WIIPA (Miller 1982). More recently, small blocks have been excavated within the area at Site 48SW1951 (McNees et al. 1988) and adjacent to the area at the Nova site (Site 48CR4419) (Thompson 1989). The most recent block excavations within and adjacent to the CD/WIIPA have occurred at Sites 48SW8142, 48SW8808, and 48SW8818 (Metcalf and McKibbin 1991). Reports detailing the results of the latter investigations are currently in preparation. Once completed, they should provide a significant contribution to the archaeological understanding of the area. Additionally, data recovery block excavations at Site 48CR5511 in the CD/WIIPA are scheduled for 1998.

3.3.2 Prehistoric Site Distributions

Prehistoric sites are nonrandomly distributed within the CD/WIIPA. There are distinct differences in site densities among the different geographic subregions within and adjacent to the area. Class III block inventories in the Echo Springs and Standard Draw Units in the southeastern Great Divide Basin portion of the area yielded site densities as high as 52 sites per section, while block inventories in the Wild Rose oil and gas field in the northeastern Washakie Basin yielded site densities of only 1-4 sites per section. In addition, certain types of sites appear to be clustered in particular geographic and topographic contexts. The CD/WIIPA also exhibits distinct differences in site densities in different environmental contexts, including topographic setting, distance to water, plant communities, and other factors. For example, numerous studies have shown a distinctly nonrandom association between sites and dunes. The nonuniformity of site densities among subregions may largely reflect the nonuniformity of these variables among subregions.

The most systematic data concerning site distributions within the CD/WIIPA are provided by the Class II inventory reports. The sampling domains for the Salt Wells Resource Area and Overland Planning Unit

Class II inventories (Treat and Tanner 1981; BLM 1984) together encompassed the entire portion of the CD/WIIPA south of I-80. The Red Desert tract of the Southwestern Wyoming Coal EIS Class II inventory fell within the northeastern edge of the area, and the Creston-Cherokee tract fell within the southeastern edge of the area (Metcalf 1977).

The Class II inventories in the area indicate that particular CD/WIIPA subregions contain higher prehistoric site densities. Areas of high site density identified during the Salt Wells Resource Area Class II inventory include a 6-mi wide band north of and adjacent to Adobe Town Rim (including The Haystacks), particularly in The Haystacks Flat area and the Man and Boy Butte badlands and a 1-mi wide band extending north from the base of Delaney Rim (Treat and Tanner 1981). Areas of high site density identified during the Overland Planning Unit Class II inventory include the area just north of the base of Delaney Rim, as well as the North Barrel Springs drainage (BLM 1984). Sender et al. (1982) identified three potential archaeological districts associated with the North Barrel Springs drainage, the Dry Lake playa basin, and Echo Springs. Various subsequent Class III inventory projects have confirmed that these areas contain particularly high site densities. The Class II inventory data from the Southwestern Coal EIS suggest that the northeastern portion of the CD/WIIPA may contain significantly lower site densities in general than the southern portion of the area. However, the concentration of sites recorded on Siberia Ridge suggests that portions of that area contain significantly higher site densities than others. Unpublished information also indicates that a concentration of Paleoindian sites is present in the Chain Lakes area in the extreme northeastern corner of the CD/WIIPA. The Paleoindian sites in that area are located primarily on the outer margins of the playas.

Site distributions and densities within the CD/WIIPA are strongly correlated with stabilized and semi-stabilized dunes and aeolian shadow deposits. The correlation was identified by both the Salt Wells Resource Area and Overland Planning Unit Class II inventories, and it has been confirmed by subsequent investigations in the region. Monitoring of pipeline trenching and well pad blading has indicated that the correlation is even stronger than is indicated by surface evidence, since a significant number of sites in aeolian contexts lack significant surface manifestations. Dunal areas in the CD/WIIPA are particularly archaeologically sensitive because of the frequency with which they contain subsurface firepits and other intact cultural features.

Another important variable influencing site distributions in the area is ecological diversity. Both the Salt Wells Resource Area and Overland Planning Unit Class II inventories indicated that site densities increase in areas with the highest vegetative diversity, as measured by the number of broad vegetative zones within a limited radius. The Salt Wells Resource Area Class II inventory report (Treat and Tanner 1981) characterizes such diversity primarily in terms of topographic diversity. It highlights the higher densities of sites in proximity to ecotones formed at the boundary between ridges and badlands and adjacent flat open areas. It also notes that dunes resting on clay flats also create an ecotonal context with increased vegetative diversity. The Overland Planning Unit Class II inventory report (BLM 1984) also notes direct correlations between vegetative diversity and site density.

A third variable apparently influencing site densities in the CD/WIIPA is proximity to drainages. Both the Salt Wells Resource Area and Overland Planning Unit Class II inventories indicate a correlation between site location and proximity to drainages. Treat and Tanner (1981) note that most of the identified sites in the Patrick Draw stratum are either along the heads of the major tributaries of Bitter Creek, Red Wash, or Patrick Draw or along Bitter Creek itself, with more than 68% of the sites being within 325 ft of a drainage feature. Likewise, the Overland Planning Unit Class II inventory (BLM 1984) indicate that site densities decreased from highest to lowest ranked drainages. Areas around permanent water sources such as springs may also exhibit higher site densities, but the number and size of such areas sampled in the Class II inventories were too small to allow assessment of this possibility.

The Class II inventory data indicate that these variables also cross-cut each other in complex ways. The Salt Wells Resource Area Class II inventory results indicate that dunal zones located along ecotones contain higher site densities than dunal zones not located along ecotones. The highest site densities in the Washakie Interior and Adobe Town strata were associated with dunes adjacent to the Adobe Town Rim (including The Haystacks), while dunal areas in the central Washakie Basin yielded lower site densities. Likewise, the Overland Planning Unit Class II inventory indicates a particularly high density of sites in association with dunal areas containing multiple broad vegetative zones within a 3-mi radius. The results of the latter inventory also indicate that site density is higher in areas where major drainages cross-cut multiple broad vegetative zones, such as North Barrel Springs Draw.

Based on the relative distribution of large and small sites, Treat and Tanner (1981) argue that residential base sites may have been situated nearer to drainages than sites of specialized seasonal activities. Likewise, the results of the Overland Planning Unit Class II inventory suggest that sites in areas with higher vegetative diversity may have been occupied more intensively, more often, and/or longer than those in other contexts. The data from both inventories suggest that plant processing sites may have been restricted to interior basin zones. Conversely, lithic scatters and isolates (particularly isolate points) are apparently the more common site type on upland ridges such as Delaney Rim.

3.3.3 Prehistoric Chronology

The CD/WIIPA is in the southern Wyoming Basin, which is geographically intermediate between the Northwestern Plains, Great Plains, Northern Colorado Plateau, and Middle Rocky Mountain physiographic provinces. The results of many early cultural resource management investigations in the region were assimilated to Frison's (1978) culture historic chronology for the Northwestern Plains. Given its proximity to the North Platte River drainage, the CD/WIIPA is expected to exhibit stronger culture historic affiliations with the Northwestern Plains than other portions of the western Wyoming Basin. At least some portions of the CD/WIIPA--particularly the eastern Washakie Basin--also support grasslands more ecologically similar to the adjacent Northwestern and Great Plains than are present in most other parts of the western Wyoming Basin. Overall, however, the area is more ecologically similar to the Great Basin and the rest of the western Wyoming Basin than it is to the Northwestern Plains. Particularly distinctive and important interior basin traits of the CD/WIIPA include mixed desert shrub vegetation, the absence of grasslands similar to those of the Northwestern Plains on most of the area, abundant sand dunes and other aeolian deposits, and numerous playas. Several investigators (e.g., Sender et al. 1982; Spath 1984) have suggested that prehistoric adaptations in the region were probably more similar to those characteristic of the Great Basin than those characteristic of the Northwestern Plains.

The archaeological record of the area exhibits characteristics of the various areas, particularly the Northwestern Plains and Great Basin. Projectile point types generally considered to be characteristic of each province have been identified within the CD/WIIPA. They include such distinctively Plains types as the Cody complex and Pelican Lake points and such distinctively Great Basin point types as Humboldt concave base and Elko eared points. Ceramics with characteristics typical of the Northern Colorado Plateau have also been identified on at least one site within the area.

Archaeological investigations over the past 20+ years have clearly demonstrated, however, that the western Wyoming Basin was not merely a "great in-between" with regard to the adjacent provinces. Instead, the prehistory of the region was characterized by well-developed cultural systems and traits distinctive of and apparently endemic to the interior basins and uplifts of southwestern Wyoming. Metcalf (1987; see also Zier et al. 1983) developed a regional culture historic chronology specifically for the western Wyoming Basin to better characterize and structure the archaeological data from the region (Figure 3.4). Metcalf's chronology has been used in most major cultural resource reports for the region (e.g., Wheeler et al. 1986; Smith and Creasman 1988; Harrell 1989), and it has become the recognized standard for the region (e.g., see Frison 1991). It provides a very effective framework for organizing the archaeological data from the region, although some aspects of the chronology have come into question and revisions of certain aspects have been proposed.

Metcalf's chronology was based primarily on peaks and valleys in the radiocarbon age frequency curve for the set of radiocarbon age estimates then on record, together with implicit and explicit assumptions about the culture historic traits of groups in the area and surrounding regions during particular time periods (Metcalf 1987). He divided the prehistory of the

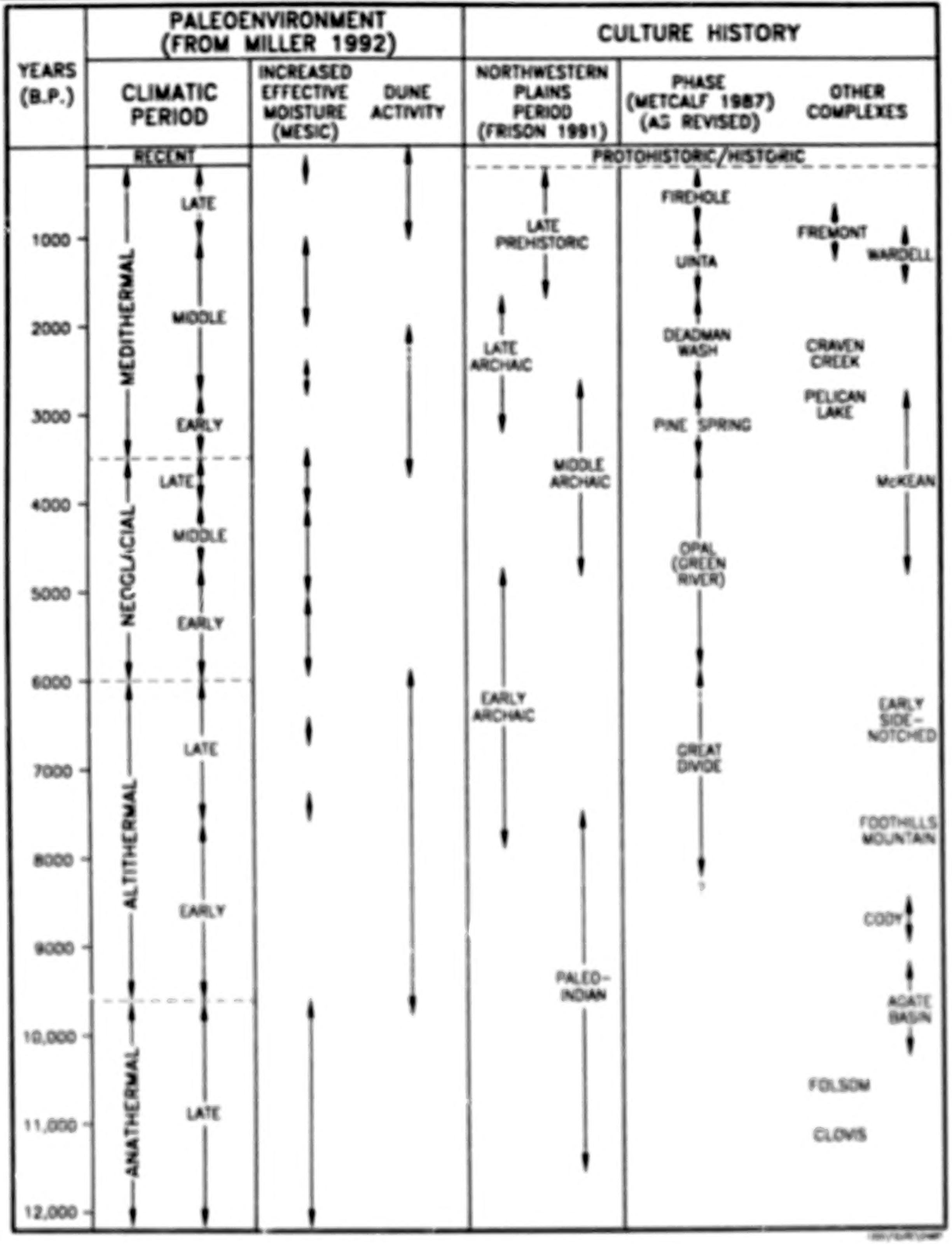

Figure 3.4 Culture Historic Chronology and Paleoenvironmental History of the Western Wyoming Basin (Based on Metcalf [1987] and Miller [1992]).

region into four broad periods--the Paleoindian period, the Archaic period, the Late Prehistoric period, and the Protohistoric period (see Figure 3.4). He further subdivided the Archaic and Late Prehistoric periods into a series of six culture historic phases. He defined a total of four phases (the Great Divide, Green River, Pine Spring, and Deadman Wash phases) within the Archaic period, and two phases (the Uinta and Firehole phases) within the Late Prehistoric period. He then briefly summarized the information available at that time (1983) concerning the cultural traits exhibited during each of the phases. The Green River phase has since been renamed the "Opal phase" following the suggestion of Wheeler et al. (1986).

Since Metcalf originally formulated his chronology in 1983, considerable additional data has accumulated for the region, and understanding of cultural traits exhibited during particular phases has become more refined (e.g., Wheeler et al. 1986; Harrell and McKern 1986; Smith and Creasman 1988; Harrell 1989; McKibbin et al. 1989; McNees et al. 1992; Thompson and Pastor 1995). The result has been a shift to increasingly substantive trait-based characterizations of phases and of the distinctions between various phases. As the characterizations of the specific phases have become more substantive, revisions have been proposed to the original chronology to bring the temporal divisions in line with the apparent temporal spans of the specific (sets of) traits. Figure 3.4 presents a revised version of Metcalf's chronology based on McNees et al. (1992) and Thompson and Pastor (1995).

Miller (1992) has also provided a detailed overview of the paleoenvironmental history of the western Wyoming Basin that is applicable to understanding the prehistory of the CD/WIIPA. It is based on a systematic synthesis of data from excavated sites throughout the region, as well as a thorough review of data from previous regional paleoenvironmental studies (e.g., Ahlbrandt 1973, 1974). It includes a general overview of climatic conditions in terms of alternating periods of cooler climate and increased effective moisture (more mesic conditions) and warmer climate with decreased effective moisture (more xeric conditions). It also includes reconstructions of the history of dune, aeolian shadow/sheet, and alluvial depositional contexts. The history of dune and aeolian shadow/sheet deposits is of particular relevance to the CD/WIIPA. Miller's (1992) overview provides a valuable framework for understanding, assessing, and synthesizing prehistoric adaptations and changes in these adaptations through time in the area. A summary of Miller's (1992) paleoenvironmental history for the western Wyoming Basin is also included in Figure 3.4.

Relatively little is known specifically about the prehistory of the southern and central Great Divide Basin/northern Washakie Basin area in comparison to other portions of the western Wyoming Basin. The existing database for the CD/WIIPA includes a large number of radiocarbon-dated features and components spanning nearly all of the past 10,000 years of human occupation in the region. This database has the potential to provide a solid basis for a detailed analytic study of the prehistory of the Great Divide Basin/northern Washakie Basin, especially in conjunction with data from recent and future data recovery excavations employing contemporary methods and standards. However, investigations have been completed in a piecemeal fashion, and the data is fragmented and scattered throughout hundreds of distinct reports, greatly limiting its availability and usefulness, and no broad synopses or syntheses of the available data have been attempted to date. This discrepancy results largely from the lack of major data recovery projects in the area relative to other portions of the Wyoming Basin, especially within the past 14 years. It also reflects the peripheral geographic location of the area relative to better studied portions of the western Wyoming Basin. Recently completed (but not yet reported) block excavations at Sites 48SW8842 and 48SW8808 (Metcalf and McKibbin 1991) and proposed block excavations at Site 48CR5511 (Murray et al. 1995) should help to remedy that situation.

Nevertheless, a sufficient number of cultural features and cultural components have been excavated within and closely adjacent to the CD/WIIPA to allow a tentative preliminary characterization of the culture historic chronology and adaptations of prehistoric groups in the northern and central Great Divide Basin and northern Washakie Basin.

Existing data from the CD/WIIPA indicate that the cultural systems, prehistoric chronology, and paleoenvironmental history of the area were similar to those found in the more thoroughly investigated

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portions of the western Wyoming Basin. They suggest a general, Archaic, dune-oriented, interior basin adaptive strategy throughout nearly the entire period of (known) human occupation, punctuated by occasional intrusions of groups from adjacent regions. The feature types, point types, faunal and botanical remains, and other assemblage characteristics at most sites in the area are generally consistent with those typical of sites in the Rock Springs Uplift and Green River Basin portions of the western Wyoming Basin. The primary contrast between the CD/WIIPA and other portions of the western Wyoming Basin involves the relatively large proportion of sites in the CD/WIIPA which have yielded early radiocarbon age estimates and the possibly greater emphasis on plant and small animal resources as opposed to the procurement of large herbivores, especially bison.

A preliminary overview of the prehistory of the CD/WIIPA has been prepared in conjunction with this EIS (BLM 1998d), and a detailed discussion of each cultural phase and associated paleoenvironmental regime is contained therein. The overview provides a more detailed discussion of the prehistory of the CD/WIIPA within the framework of Metcalf's (1987) regional culture historic chronology and Miller's (1992) paleoenvironmental chronology.

3.3.4 Historic Site Types and Distributions

Historic sites within the CD/WIIPA fall into two general classes. One class consists of prominent historic sites well-documented in the historic literature, such as the Overland Trail, Union Pacific (UP) Railroad, or Wamsutter townsite. It also includes ancillary sites associated with many of these named historic sites, such as stage stations and railroad sidings. The other class consists of historic sites that are more archaeological in character, including trash scatters and historic campsites.

The most prominent historic sites in the area are linear transportation sites. They include the Overland Trail (Site 48SW1226/48CR932), the UP Railroad, the Lincoln Highway, and U.S. Highway 30, as well as lesser roads such as the Wamsutter-Baggs Road (Site 48SW10277/48CR5739). While the most commonly delineated route of the Cherokee Trail (Site 48SW3680) passed to the south of the CD/WIIPA, the Evans Route of the trail crosses the area.

The Overland Trail traversed the southern portion of the CD/WIIPA. It was cleared and locally improved across the region. Ancillary sites within the area include Fort LaClede and the Coal Gulch, Dug Springs, and LaClede Stage Stations, all of which contained stone buildings. The history of the Overland Trail as a whole is well-documented, as is the history of some individual stations for which National Register of Historic Places nomination forms have been completed. Other more obscure sites which might be expected in conjunction with the Overland Trail include emigrant and freighter camps, locations at which limited tasks were conducted (such as repairing wagons), graves, inscription sites, and sites associated with Native American raiding parties and battles along the trail. To date, no sites of these types have apparently been identified or recognized in the area, with the exception of the Red Rock inscriptions (Site 48SW771) near Barrel Springs Draw.

The UP Railroad bisected the CD/WIIPA. The modern railroad still follows the original alignment through portions of the area. However, in other locations the modern grade has been realigned. As a result, portions of the abandoned 1868 grade and later grades are present in the area. Numerous historic railroad stations, section houses, and siding sites are also present within the area, though the structures at such sites have typically been razed. Sites include the Creston, Latham, old Latham, Washakie, Wamsutter, Frewen, Red Desert, and Tipton station/section house sites and the Joshua and Fillmore sidings. Related townsites include Wamsutter, Creston, and Red Desert. Less prominent sites may also occur in association with the railroad, including construction camps and graves.

In the spring of 1849, Lewis and Evans led a group of Euro-Americans and members of the Cherokee Indian Nation from Oklahoma to California (Fletcher et al. 1995). The Evans Route of the Cherokee Trail in the vicinity of the CD/WIIPA passed just south of Rawlins, southwest to Echo Springs, northwest to just north of Tipton, and west to Point of Rocks. The route did not traverse Bridger's Pass, west of present-day Saratoga, Wyoming, as depicted in several early works on trails history (Beard 1933). In 1850, four separate companies of Euro-Americans and Cherokees blazed a second route across the extreme southern portion of Wyoming, dipping into northern Colorado several times on their way to Fort Bridger

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along the Oregon Trail (Fletcher et al. 1995). This route is far to the south of Evans' route of 1849 and is outside the CD/WIIPA. Because Cherokee Indians accompanied both the 1849 and 1850 parties that crossed southern Wyoming, there has been considerable confusion as to the route of the Cherokee Trail in the historic literature (Fletcher et al. 1995). The Cherokee Trail was never used again as a migratory emigrant route across Wyoming. The Overland Trail replaced the trail as the main thoroughfare from 1862 until 1869, when the transcontinental railroad was completed.

Abandoned portions of the Lincoln Highway (a transcontinental road across the U.S.) have been recorded in areas adjacent to the CD/WIIPA. The road was constructed between 1919 and 1924, and intact segments likely occur across the CD/WIIPA in the vicinity of I-80.

Another prominent class of historic sites in the region consists of historic homesteads, ranches, and major ranch facilities. The CD/WIIPA contains few such sites. They include the Larsen Ranch (Site 48SW4086), the Hadsell Winter Headquarters (Site 48SW4056), and the Uncle Bar Sheep Ranch camp (Site 48SW4057), all of which are in the northeastern portion of the area. Ancillary historic sites which might be expected in the area include shearing pens, lambing pens, corrals, windmills, ditches, and stock ponds.

3.4 SOCIOECONOMICS

The CD/WIIPA is located in Sweetwater and Carbon Counties, and communities in both counties are likely to be affected by the proposed development. Socioeconomic data for Sweetwater and Carbon Counties and the towns of Rawlins, Wamsutter, and Rock Springs are included in this discussion.

3.4.1 Demography

3.4.1.1 Population Dynamics and Census Data

Wyoming's population increased from 332,416 to 469,557 (+41%) between 1970 and 1980 as people moved into the state seeking employment in mining, petroleum, and related industries. Falling mineral prices in the early 1980s slowed the influx of job-seekers and brought significant unemployment. By 1990, Wyoming's population had fallen to 453,589, 3.4% lower than the 1980 level (U.S. Department of Commerce [USDC] 1992a); however, Wyoming's 1996 population estimate increased to 481,400 (personal communication, September 1997, with Wenlin Liu, Wyoming Division of Economic Analyses).

Populations in Carbon and Sweetwater Counties increased 64% and 127%, respectively, during the 1970-1981 energy boom. However, the subsequent slump in energy production between 1981 and 1987 resulted in increased unemployment in Carbon County, and by 1990 the county's population had decreased by 24%. Population decreases between 1981 and 1990 in Sweetwater County (7%) were less than in Carbon County due to continued high levels of oil and gas exploration and increased demands for soda ash, which is mined in the western portion of Sweetwater County. The 1996 population estimates for Carbon and Sweetwater Counties were 15,855 and 40,322, respectively (personal communication, June 1997, with Wenlin Liu, Wyoming Division of Economic Analyses). Populations in Rawlins, Rock Springs, and Wamsutter reflected trends similar to the counties in which they are located. Populations in these towns in 1996 were estimated to be 9,178, 20,496, and 268, respectively (personal communication, June and September 1997, with Wenlin Liu, Wyoming Division of Economic Analyses).

3.4.1.2 Economic Base and Employment

Sweetwater County was buffered to some extent from recent economic declines, due primarily to trona mining and oil and gas exploration. Five companies refine soda ash from mined trona in the county, some growth is expected in the trona industry, and prices are expected to increase slightly over the next 5 years (Sweetwater County Economic Development Association [SWEDA] 1992). With the passage of the *Clean Air Act* amendments in 1990, mining of low-sulfur coal in Sweetwater County is expected to increase. As oil production continues to decline, natural gas production is increasing (SWEDA 1992). Sweetwater County's labor force in 1980 was 21,116, with an unemployment rate of 3.7%; in 1996, average employment was 18,963, with an unemployment rate of 5.3% (Wyoming Department of Employment [WDOE] 1996; personal communication, April 1997, with Mr. Dave Bullard, Statistician, WDOE, Casper). In the private sector, the mining industry employed the largest number of people in Sweetwater County (3,846) in 1996 and paid the highest weekly wage ($1,009 per week) of any employer (WDOE 1996). Average annual wage in Sweetwater County during 1996 was $30,379, which was higher than the state average of $22,870.

Within Carbon County, overall earnings in the agriculture sector between 1980 and 1986 declined 64%, while the nonagriculture sector declined 28%. Major reductions in the mining and construction sectors were responsible for most of the decline in the nonagriculture industries, and small to modest earning increases in services, transportation/utilities, manufacturing, and government did not offset large declines in mining and construction (Grafton and Brown 1988). In 1980, Carbon County's labor force was 10,346, with an unemployment rate of 3.3%. In 1996, the county's average employment was 6,396 with an unemployment rate of 5.3% (WDOE 1997; personal communication, April 1997, with Mr. Dave Bullard, Statistician, WDOE, Casper). Retail trade and local government were the largest employers in Carbon County during 1996, employing an average of 1,352 and 1,240 people each month, respectively. Average annual wage in Carbon County in 1996 was $21,412, and the highest wages were paid by mining ($906 per week), manufacturing ($662 per week), and the federal government ($666 per week) (WDOE 1997).

3.4.1.3 Housing

In 1996, year-round housing units in Carbon County numbered 8,240, with a vacancy rate of 30.7% (2,529 vacant units) (personal communication, September 1996, with Wenlin Liu, Wyoming Division of Economic Analysis). Of 6,001 occupied units in the county in 1990, 72% were family households and 28% were nonfamily households. Persons per household averaged 2.6 (USDC 1992b). Sweetwater County had 15,444 year-round housing units in 1990, with a vacancy rate of 12% (1,828 vacant units). The vacancy rate for year-round rental units was 14%, whereas the owner-occupied vacancy rate was 3%. Of 13,616 occupied units in the county, 70% were owner-occupied and 30% were renter-occupied (BLM 1997b). Persons per household averaged 2.8 in 1990 (USDC 1992b). There were approximately 4,761 housing units in Rawlins in 1996, and approximately 3,306 of these were occupied (personal communication, September 1997, with Wenlin Liu, Wyoming Division of Economic Analysis). Rawlins has 17 hotels and motels (951 rooms) and three RV parks (400 spaces) (Wyoming Department of Commerce [WDOC] 1994). In addition, there are five mobile home parks with approximately 1,280 pads (personal communication, June 1995, with Andrea Sheppard, ERA Saulcy Land Co., Inc., Rawlins). In 1997, Wamsutter had approximately 131 housing units with 15 vacancies, and there were 27 mobile home pads available. Wamsutter has two motels (32 rooms) and an RV park with 10 spaces (personal communication, September 1997, Susan Carnes, Wamsutter Town Clerk/Treasurer).

By late 1997, approximately 16,400 housing units existed in Sweetwater County, including 10,415 single-family units, 1,809 multi-family units (duplexes and apartments), and approximately 4,169 mobile homes. In June 1998, 50 apartments, 10 houses, and 14 mobile homes were available for rent and approximately 200 houses were for sale in Rock Springs (personal communication, July 1998, Teri Deakins, BLM, Rock Springs.)

3.4.2 Infrastructure

The WDOC publishes community profiles for towns throughout the state. The following descriptions of Rawlins and Rock Springs were based on information presented in community profiles (WDOC 1994). The description of Wamsutter was based on information supplied by Susan Carnes (personal communication, June 1995, with Susan Carnes, Town Clerk/Treasurer, Wamsutter).

Rawlins. Rawlins is located along I-80 in central Carbon County. Rawlins serves as the governmental and economic hub of Carbon County. Law enforcement and fire protection are provided by 20 full-time police officers, eight full-time firemen, 20 volunteer firemen, and a 911 emergency number. A City Planning Commission administers zoning regulations and building codes and approves industrial plans (Carbon County Chamber of Commerce 1992). Public education is provided by three elementary schools, a junior high school, and a high school. Western Wyoming College in Rock Springs serves

Rawlins through the Carbon County Higher Education Center. Community services consist of a library (60,000 volumes), two daycare centers, a senior center, and 16 churches. Commercial services include two shopping centers and a convention facility (1,000-person capacity). Medical care is provided by a hospital (93 beds), a nursing home (48 rooms), eight doctors, five dentists, and an ambulance service. Communications include a newspaper, cable TV, two local radio stations and a radio station translator, US West and MCI telephone service, and a first-class post office. Recreational resources include nine baseball fields, eight tennis courts, a swimming pool, a bike path, four soccer fields, a skating rink, a movie theater, a city recreation center, and eight parks. Outdoor recreation opportunities are available on public lands adjacent to town administered by the BLM and in the Medicine Bow National Forest, administered by the USFS, located 42 mi southeast of town. Excess capacity exists for electricity, natural gas, water, and wastewater treatment. Solid waste disposal is available at a landfill located north of town. Population decreases that occurred during the 1980s allow the current infrastructure of Rawlins to accommodate an expanded population. Major employers include Union Pacific Railroad Company, Sinclair Refinery, and local, state, and federal government.

Rock Springs. Rock Springs is located along I-80 in west-central Sweetwater County and serves as the economic hub of the area. Law enforcement and fire protection services are available, as well as a 911 emergency number. A City Planning Commission administers zoning regulations and building codes and approves industrial plans. Public education is provided by 11 elementary schools, two junior high schools, and one high school. Western Wyoming Community College is also located in the city. Community services consist of two libraries (107,000 volumes), eight day care centers, and 32 churches. Commercial services include two shopping centers, five convention facilities (with a total capacity of 4,660 persons), 25 hotels and motels (1,400 rooms), an RV park (50 spaces), and several mobile home parks. Medical care is provided by a hospital (100 beds), a nursing home (100 rooms), 33 doctors, 24 dentists, and an ambulance service. Communications consist of two local daily newspapers (one published in Rock Springs and one in Green River), cable TV, US West telephone service, reception of two AM and three FM radio stations, and two post offices.

Recreation resources include 17 baseball fields, 24 tennis courts, six swimming pools, eight soccer fields, a golf course, one ice skating rink, two recreation centers, and 24 parks. Outdoor recreation opportunities available within 30 mi of the city include Flaming Gorge National Recreation Area and various opportunities on BLM-administered lands, including Boar's Tusk, sand dunes, petroglyphs, and the Oregon/California Trails. Cultural/entertainment attractions include the Red Desert Rodeo, the Sweetwater County Museum, the historical Rock Springs City Hall Museum, the Fine Arts Center, and the Western Wyoming Community College Dinosaur Collection.

Major employers are FMC Wyoming Corporation, General Chemical, OCI Wyoming, Bridger Power, Solvay Minerals, and Black Butte Coal. The mining industry employs 27% of the Rock Springs work force.

A wastewater treatment plant built in the late 1980s contains excess capacity, and a new district with excess capacity recently has been formed for solid waste. Rock Springs has been on summer water rationing for the past several years because of an inadequate water treatment system, but a new water treatment plant is currently being planned and is expected to be on-line in 1999 (personal communication, March 1995, with Deanna Holloway, Administrative Assistant, Green River/Rock Springs Joint Powers Water Board).

Wamsutter. Wamsutter is a community of approximately 375 located on I-80 in eastern Sweetwater County. The resident population of the community has increased and decreased in response to the boom-and-bust swings of energy development. The town is incorporated and provides its own land use planning.

Wamsutter's law enforcement and fire protection are provided by a full-time City Marshall and approximately 12 volunteer firemen. Three other law enforcement personnel live in Wamsutter (a Deputy County Sheriff and two Wyoming State Highway Patrolmen). An ambulance service staffed by 10 emergency medical technicians provides emergency medical care. In past years, Wamsutter had a medical clinic staffed by two doctors and a dentist who commuted to the town about once monthly; however, the population decline during the 1980s made it impractical to maintain the clinic. The vacant facility is available for a renewal of services given sufficient population growth. Major employers are Colorado Interstate Gas Company, Amoco, Union Pacific Railroad, Highland Enterprises, B&E Trucking, and Desert School. Colorado Interstate Gas Company houses three employee families in Wamsutter, whereas Amoco employees generally commute from Rawlins. Desert School (Rock Springs School District #1) has approximately 75 pupils presently enrolled in grades K-8. High school students are bused to Rawlins. Community services consist of four churches and Desert School, which is used extensively for social, cultural, and recreational activities. A city/county park and two city parks provide opportunities for tennis, basketball, baseball, and volleyball, as well as playground space for children. Electricity is supplied by Pacific Power and Light Company, while natural gas is supplied by Mountain Fuel Supply Company. The water supply consists of four wells, three of which are currently in use. Wastewater treatment consists of a three-cell aerated lagoon system with a capacity for a population of 1,500. Solid waste disposal services are provided by Sweetwater County Solid Waste District #2 which includes a nearby landfill (personal communication, June 1995 and September 1997, Susan Carnes, Town of Wamsutter, Town Clerk/Treasurer). Outdoor recreation is available on adjacent BLM-administered lands and in the Medicine Bow National Forest to the southeast.

3.4.3 Local Government Revenues

Carbon County had an assessed valuation of $259.8 million in 1996 (Wyoming Department of Revenue [WDR] 1997) (Table 3.17). The assessed valuation of Rawlins in 1996 was $20.1 million (Wyoming Taxpayers Association 1996). Taxes on the mineral industry are the primary source of tax revenue for the county, and the natural gas industry provided 53.7% of this tax base (UW 1996). The 1996 assessed valuation of natural gas production in Carbon County was $88.8 million, and in 1995 natural gas production provided the county and cities/towns with $14,000 and $235,000, respectively, in returned federal mineral royalties. In 1995, the state's share of federal mineral royalty revenues ($2.3 million from natural gas in Carbon County) was distributed among the Wyoming School Foundation Program (40.0%); the Highway Fund (23.4%); Capital Construction for Cities, Towns, Counties, and Special Districts (9.8%); Cities and Towns (8.4%); the University of Wyoming (6.0%); the Legislative Royalty Impact Account (4.3%); the Highway Fund for County Roads and State Aid to County Roads (4.0%); School Districts Capital Construction (2.4%); and other accounts (1.7%) (BLM 1997b). Additional public schools and local governments in Carbon County received $4.9 million and $2.3 million, respectively, in state natural gas production tax revenues (Table 3.17).

Total sales and use taxes collected in Carbon County for fiscal year 1996 were $9.6 million (WDR 1997). Sales and use taxes are distributed to cities and towns within each county and to the county's general fund. In 1995, the City of Rawlins received $2.4 million of this total, whereas the Carbon County general fund received $574,000. Ad valorum taxes, which include property taxes, are collected by the county and dispersed to schools, cities, towns, the state foundation, and other county subdivisions. Ad valorum taxes collected in Carbon County during 1996 totalled $18.0 million. Severance taxes, which are collected by the state for the extraction of resources such as oil, natural gas, and coal, are partially retained by the state (83%) with the remainder being returned to cities, towns, and counties. In fiscal year 1996, $161,000 in severance taxes were dispersed to Carbon County, and $318,000 to the City of Rawlins (personal communication, September 1996 and June 1997, Wyoming State Treasurer's Office).

Sweetwater County had an assessed valuation of $988.1 million in 1996 (WDR 1997) (Table 3.17). The assessed valuation of Rock Springs was $63.5 million and was $1.3 million for Wamsutter (Wyoming Taxpayers Association 1996). Taxes on the mineral industry are the primary source of tax revenues for the county, and the natural gas industry provided 39.7% of this base (UW 1996). The 1996 assessed valuation of natural gas production in Sweetwater County was $185.7 million, and in 1995 gas production provided the county and cities/towns with $55,000 and $937,00, respectively, in returned federal mineral royalties. Additionally, public schools and local governments in Sweetwater County received $13.1 million and $7.7 million, respectively, in state natural gas production tax revenues.

Table 3.17 Economic Statistics for Local Governments in Areas Potentially Affected by the Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming.

	1996 Assessed Valuation							
Area	Total	Natural Gas Production	1995 Federal Royalties on Gas Production	1995 State's Share of Federal Gas Production Royalties	1995 County's Share of Federal Gas Production Royalties	1995 Cities/Towns Share of Federal Gas Production Royalties	1995 Public School Share of Gas Wyoming Production Tax Revenue	1995 Local Government Share of Wyoming Gas Production Tax Revenue
Carbon County	$259.8 million	$88.8 million	$4.5 million	$2.3 million	$14,000	$235,000	$4.9 million	$2.3 million
Sweetwater County	$988.1 million	$185.7 million	$18.0 million	$9.0 million	$55,000	$937,000	$13.1 million	$7.7 million

[1] Adapted from WDR (1997), Wyoming Taxpayers Association (1996), UW (1996).

Sales and use taxes collected in Sweetwater County in fiscal year 1996 totalled $35.6 million, with the county general fund receiving $2.6 million, Rock Springs receiving $7.9 million, and Wamsutter receiving $100,126 (WDR 1996). Property taxes collected in Sweetwater County in 1996 totalled $70.7 million (WDR 1997), and in 1996 Sweetwater County, Rock Springs, and Wamsutter received $355,000, $645,000, and $8,000, respectively, in severance tax revenues (personal communication, September 1996 and June 1997, Wyoming State Treasurer's Office).

3.4.4 Environmental Justice

Executive Order 12898 directs BLM to assess whether the Proposed Action or alternatives would have disproportionately high and adverse human health or environmental impacts on minority and low-income populations. Identification of environmental issues is accomplished through public involvement and the scoping process. Native American tribes potentially affected by the project have been contacted by BLM and invited to comment on the Proposed Action and alternatives. The BLM determined that issues associated with environmental justice would not be affected by the project; therefore, they are not discussed further in this EIS. Coordination with Native American tribes will continue, especially regarding cultural resources and air quality issues.

3.5 LAND USE

Landownership within the CD/WIIPA is primarily a checkerboard pattern of alternating federal and private ownership (see Map 1.2). The checkerboard pattern is a result of early railroad grants made by the federal government to the Union Pacific Railroad Company. Surface ownership of the 1,061,200-acre CD/WIIPA is approximately 531,400 acres (50%) federal, 520,000 acres (49%) private, and 9,800 acres (1%) state (see Map 1.2). The BLM administers federal lands, and the State of Wyoming manages the State School Trust Lands. In addition, approximately 55% of the mineral estate in the CD/WIIPA (587,100 acres) is not federally owned.

The CD/WIIPA is within both the BLM's GDRA and GRRA, and the major land uses within the area are livestock grazing, wildlife and wild horse habitat, oil and gas exploration and development, and dispersed outdoor recreation (e.g., hunting, hiking, camping, wild horse and wildlife observation, nature photography, and off-road vehicle (ORV) use. In addition, approximately 19,000 acres of private land is being developed for residential use (ranchettes) north of I-80 near the town of Red Desert (see Map 1.2), and other rural residences are present on the CD/WIIPA.

There are numerous prior authorizations for the public lands within the CD/WIIPA. Land authorizations within the CD/WIIPA include natural gas and oil developments and transportation, power, and communications ROWs. Development of natural gas resources under the Proposed Action would occur only on lands leased or owned by the area operators, and rights to develop other leases on the CD/WIIPA would not be violated.

Developments within the CD/WIIPA occupy approximately 22,100 acres and are primarily the result of roads (9,700 acres [44%]) (Table 3.18). Oil and gas field activities including well locations, pipelines, and ancillary facilities occupy 9,500 acres (43%). Other developments on the CD/WIIPA occupy 2,900 acres (13%).

3.5.1 Agriculture/Rangeland

Livestock grazing is the major form of agricultural activity within the CD/WIIPA due to limited water, aridity, and poor soil. Portions of 26 grazing allotments cover 1,044,900 acres (98.5%) of the CD/WIIPA (Table 3.19, Map 3.15). The Rock Springs Allotment occupies 309,300 acres (29.1%) and provides 35,552 AUMs for an average of 8.7 acres per AUM (Table 3.19, Map 3.15). (An AUM is defined as the amount of forage required to maintain a 1,000-pound cow and a calf under 6 months of age, five sheep, or one horse for 1 month.) The portion of the allotment within the CD/WIIPA provides primarily winter use by sheep, although some cattle use occurs and yearlong use is permitted. In addition, there are four WHHMAs within the Rock Springs Allotment.

The Monument Lake Allotment includes 119,000 acres in the CD/WIIPA (11.2%), provides 13,077 AUMs, and has an average of 9.1 acres per AUM (Table 3.19, Map 3.15). There is no fencing within this allotment and, as a result, wild horses use the area (personal communication, June 1995, with Mike Calton, BLM, Rawlins, Wyoming).

Other large allotments on the CD/WIIPA include Chain Lakes (56,600 acres, 2,550 AUMs, 5.3% of the area), North Wamsutter (56,200 acres, 5,962 AUMs, 5.3% of the area), the North Barrel (52,700 acres, 5,490 AUMs, 5.0% of the area) (Table 3.19, Map 3.15). Twenty-one allotments--Coal Bank Wash, Cyclone Rim, Doty Mountain, Echo Springs, Jawbone, Latham, Lazy YS Ranch, Monument Draw, North Creston-West, North LaClede, North Tipton, Red Desert (GDRA), Red Desert (GRRA), Rife, Riner, Ruby Knolls, South LaClede, South Red Desert, South Wamsutter, Stewart Creek, and Tipton--account for the remaining acreage within the CD/WIIPA (Table 3.19, Map 3.15). There are also 16,300 acres of land not included in allotments within the area (see Map 3.15). These areas primarily consist of private land and cover 1.5% of the project area (Table 3.19).

3.5.2 Recreation

Public land in and adjacent to the CD/WIIPA is an important recreational resource for both Wyoming residents and nonresidents, and offers a wide variety of recreational opportunities in diverse settings, including hunting, camping, ORV use, wildlife and wild horse viewing, sightseeing (old ranches), and hiking. However, no developed recreation resources exist within the CD/WIIPA, nor are there any WSAs or ACECs. The Red Desert Basin is nationally recognized and is commonly visited by hikers from the Continental Divide National Scenic Trail just east of the project area (personal communication, May 1995, with Andy Tenney, BLM). Some visitation occurs along the Overland Trail which crosses the southern portion of the CD/WIIPA (see Map 3.16, Section 3.6) and in the Chain Lakes area in the northeastern portions of the CD/WIIPA (see Map 3.1). The checkerboard pattern of landownership in much of the CD/WIIPA often limits access and recreational opportunities on CD/WIIPA public lands. Much of the private land in the CD/WIIPA is owned by UP, and most UP lands are leased, with access to these lands is at the discretion of the lessees. UP allows public access to their lands, but does not allow overnight camping.

Limited recreational use data are available for the CD/WIIPA; however, big game hunting is likely the most important use. During the 1996 hunting season, 8,251 hunters spent 36,173 recreation days hunting pronghorn, mule deer, and elk within herd units that occur in the CD/WIIPA (Table 3.20). These figures include considerably more acreage than that contained in the CD/WIIPA, since only portions of each herd unit occur within the CD/WIIPA. The average number of days to harvest a pronghorn ranged from 2.4 (Red Desert herd) to 4.5 (Baggs herd) in 1996; a

Table 3.18 Existing Developments Within the Continental Divide/Wamsutter II Natural Gas Project Area, Sweetwater and Carbon Counties, Wyoming, 1999.

Development Type	Acreage
Roads	
I-80	900
Other Paved	600
County	800
Collector/Local	2,900
Resource	2,500
Two-track	2,000
Subtotal Roads	9,700
Oil and Gas	
Locations	2,800
Pipelines[1]	6,200
Ancillary Facilities	500
Subtotal Oil and Gas	9,500
Other	
Railroad	1,100
Cultivated Areas	800
Gravel Pits	200
Residential/Urban Areas	600
Other (e.g., impoundments, utility lines)	200
Subtotal Other	2,900
Total	22,100

[1] Includes 2,500 acres of unreclaimed pipeline.

Table 3.19 Grazing Allotment Acreage and AUMs, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.[1]

Allotment	Total Acres in Allotment	Total AUMs	Acres/ AUM	Approximate Acres in CD/WIIPA	Approximate AUMs in CD/WIIPA	Percent of Project Area	Livestock Types
Chain Lakes (10722)	62,256	2,805	22.2	56,600	2,550	5.3	Cattle
Coal Bank Wash (10604)	7,669	1,053	7.3	1,300	178	0.1	Cattle
Cyclone Rim (10103)	255,518	24,204	10.6	20,700	1,953	2.0	Cattle, sheep
Doty Mountain (10415)	83,368	10,512	7.9	6,100	772	0.6	Cattle
Echo Springs (10607)	46,148	5,093	9.1	30,600	3,363	2.9	Cattle
Jawbone (00709)	23,128	2,653	8.7	15,000	1,724	1.4	Cattle
Latham (00714)	39,913	3,632	11.0	39,900	3,632	3.8	Cattle, horses
Lazy YS Ranch (10626)	11,773	1,898	6.2	9,000	1,452	0.8	Cattle
Monument Draw (00710)	15,417	1,634	9.4	15,400	1,634	1.5	Cattle
Monument Lake (00711)	119,437	13,146	9.1	119,000	13,077	11.2	Cattle
North Barrel (10611)	55,920	5,835	9.6	52,700	5,490	5.0	Cattle, sheep
North Creston-West (00713)	10,871	1,178	9.2	10,700	1,163	1.0	Cattle
North LaClede (10613)	41,721	4,410	9.5	41,700	4,410	3.9	Cattle, sheep
North Tipton (00715)	26,117	2,843	9.2	26,100	2,837	2.5	Cattle
North Wamsutter (00716)	56,167	5,962	9.4	56,200	5,962	5.3	Cattle, sheep, horses
Red Desert-RFO (00705)	46,731	3,793	12.3	46,700	3,793	4.4	Cattle
Red Desert-RSFO (13012)	260,584	11,331	23.0	8,700	378	0.8	Cattle
Rife (04002)	44,753	2,995	14.9	13,900	933	1.3	Cattle
Riner (10615)	57,075	8,257	6.9	11,000	1,594	1.0	Cattle, sheep, horses
Rock Springs (13018)	2,029,319	232,149	8.7	309,300	35,552	29.1	Cattle, sheep, horses
Ruby Knolls (00717)	30,166	2,744	11.0	30,200	2,744	2.8	Cattle
South LaClede (10610)	53,831	6,408	8.4	36,900	4,393	3.5	Cattle, sheep
South Red Desert (10619)	10,366	1,680	6.2	10,400	1,680	1.0	Cattle
South Wamsutter (10620)	31,020	2,648	11.7	31,000	2,648	2.9	Cattle
Stewart Creek (10102)	188,991	9,648	19.6	3,800	194	0.4	Cattle
Tipton (10621)	60,679	9,535	6.4	42,000	6,562	4.0	Cattle, sheep
No Allotment	NA	NA	NA	16,300	NA	1.5	NA
Total	3,668,938	378,046	10.0[2]	1,061,200	110,668	100.0	Cattle, sheep, horses

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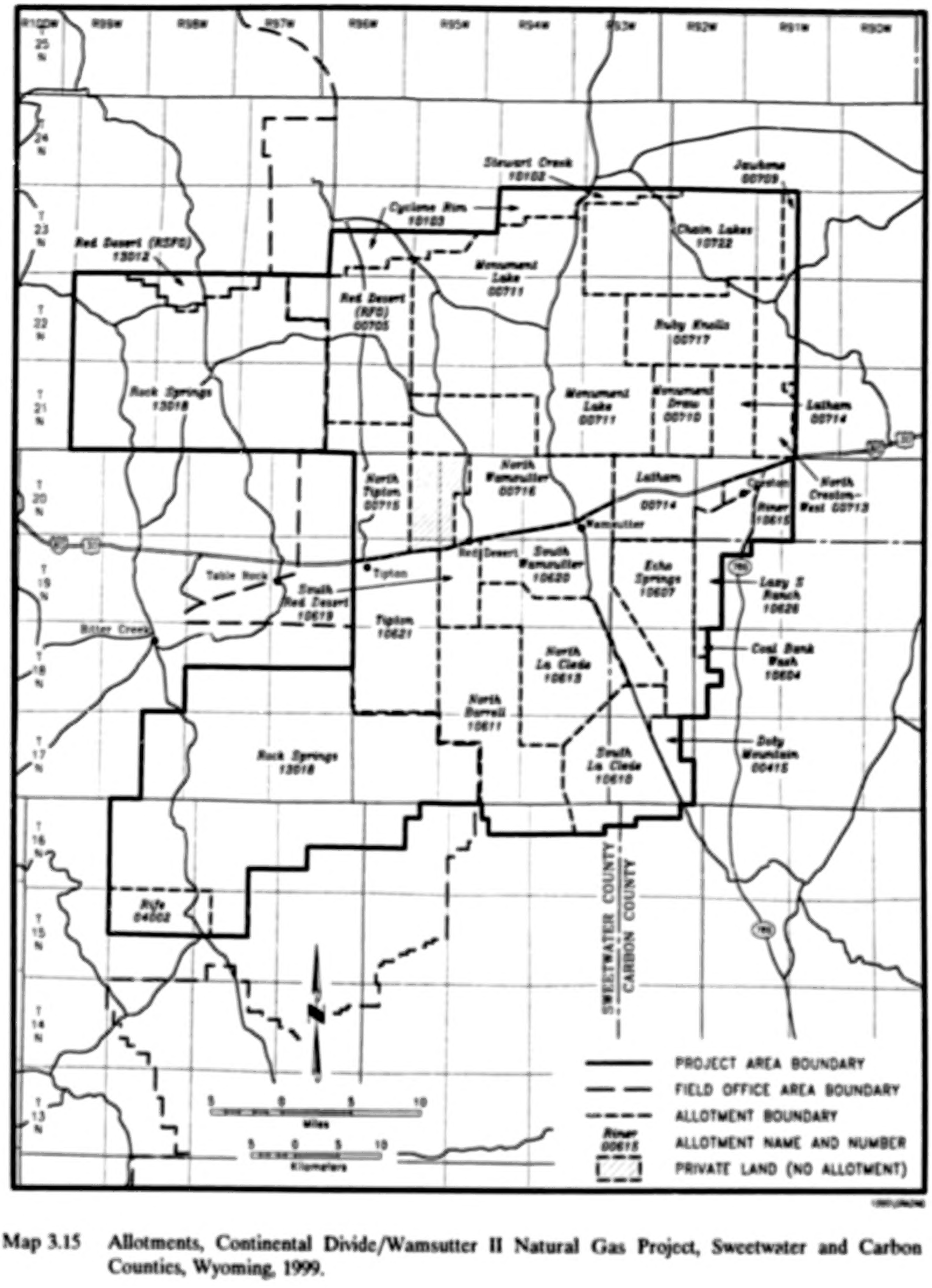
[1] Adapted from BLM (1992, 1993a, 1997d).

[2] Weighted average acres/AUM for CD/WIIPA.



Map 3.15 Allotments, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Table 3.20 Selected 1996 Big Game Herd Unit Harvest Statistics, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.[1]

Species/Herd Unit	Harvest	No. of Hunters	Recreation Days[2]	Days/Animal Harvested
Pronghorn				
Baggs Herd	188	221	838	4.5
Bitter Creek Herd	549	596	1,532	2.8
Red Desert Herd	431	485	1,019	2.4
Mule Deer				
Baggs Herd	1,042	2,160	6,477	6.2
Chain Lakes Herd	31	78	304	9.8
South Rock Springs Herd	169	250	1,333	7.9
Steamboat Herd	170	494	1,503	8.8
Elk				
Petition Herd	20	61	266	13.3
Shamrock Herd	24	32	102	4.3
Sierra Madre Herd	1,155	3,737	22,156	19.2
Steamboat Herd	120	137	643	5.4

[1] Adapted from WGFD (1997a, 1997b).
[2] Recreation day = any portion of a 24-hr day spent hunting by one person.

mule deer from 6.2 (Baggs herd) to 9.8 (Chain Lakes herd); and an elk from 4.3 (Shamrock herd) to 19.2 (Sierra Madre herd) (WGFD 1997a, 1997b). Some additional hunting of sage grouse, mourning doves, cottontails, and predators also occurs in the CD/WIIPA.

3.5.3 Transportation

Surface transportation in the CD/WIIPA is provided by a network of 2,700 mi of primary, secondary, local, and primitive roads. I-80, which bisects the CD/WIIPA, is the principal roadway linking the CD/WIIPA and Carbon and Sweetwater County towns and cities with the rest of southern Wyoming and the national highway system. Rock Springs, Rawlins, and Wamsutter are located adjacent to I-80. Access to the CD/WIIPA is provided by several state, county, and BLM roads running north and south from I-80 that are used for recreation, grazing management, and mineral exploration and development (see Map 2.1). Further detail on the roads in the CD/WIIPA is available from BLM Rawlins and Rock Springs District Offices (BLM 1997b).

The main east/west rail line of the UP Railroad bisects the CD/WIIPA (see Map 2.1). This line links Rock Springs, Rawlins, Wamsutter, and other southern Wyoming communities with the rest of the U.S.

A small community airport is located at Rawlins. No commercial airlines serve Rawlins; however, a charter service is available (WDOC 1993). Daily commercial airline service is provided at Rock Springs, approximately 40 mi west of the CD/WIIPA.

3.6 AESTHETICS AND VISUAL RESOURCES

The CD/WIIPA landscape can be viewed from I-80, the major thoroughfare bisecting the area from east to west, and from numerous improved and unimproved roads present in the area (see Map 2.1). The landscape is primarily open undisturbed rangelands vegetated by sagebrush, grasses, saltbush, and greasewood, with occasional cottonwoods and willows along drainages and scattered junipers at higher elevations in the southern portion of the CD/WIIPA (see Section 3.2.1). Topography is often broken by ephemeral drainages and rock outcrops. Major geological features include Delaney Rim and The Haystacks (see Section 3.1.4).

Developments within the CD/WIIPA occupy approximately 22,100 acres (see Table 3.18) and include approximately 720 active and/or unreclaimed gas wells, 2,700 mi of improved and unimproved roads, and 6,200 mi of pipeline corridors. These and other developments (2,900 acres) are obvious in the existing landscape character and contribute to visual resource characteristics on much of the CD/WIIPA.

The BLM has developed the VRM system to specify objectives for maintaining or enhancing visual resources, including the amount of acceptable change to the existing landscape necessary to meet established goals. The VRM system uses five classes to define visual resource values, ranging from Class I, the most restrictive (e.g., wilderness areas), to rehabilitation areas (formerly Class V), where, among other things, the natural character of the landscape has been disturbed to the point where rehabilitation is needed to bring it up to one of the other four classifications.

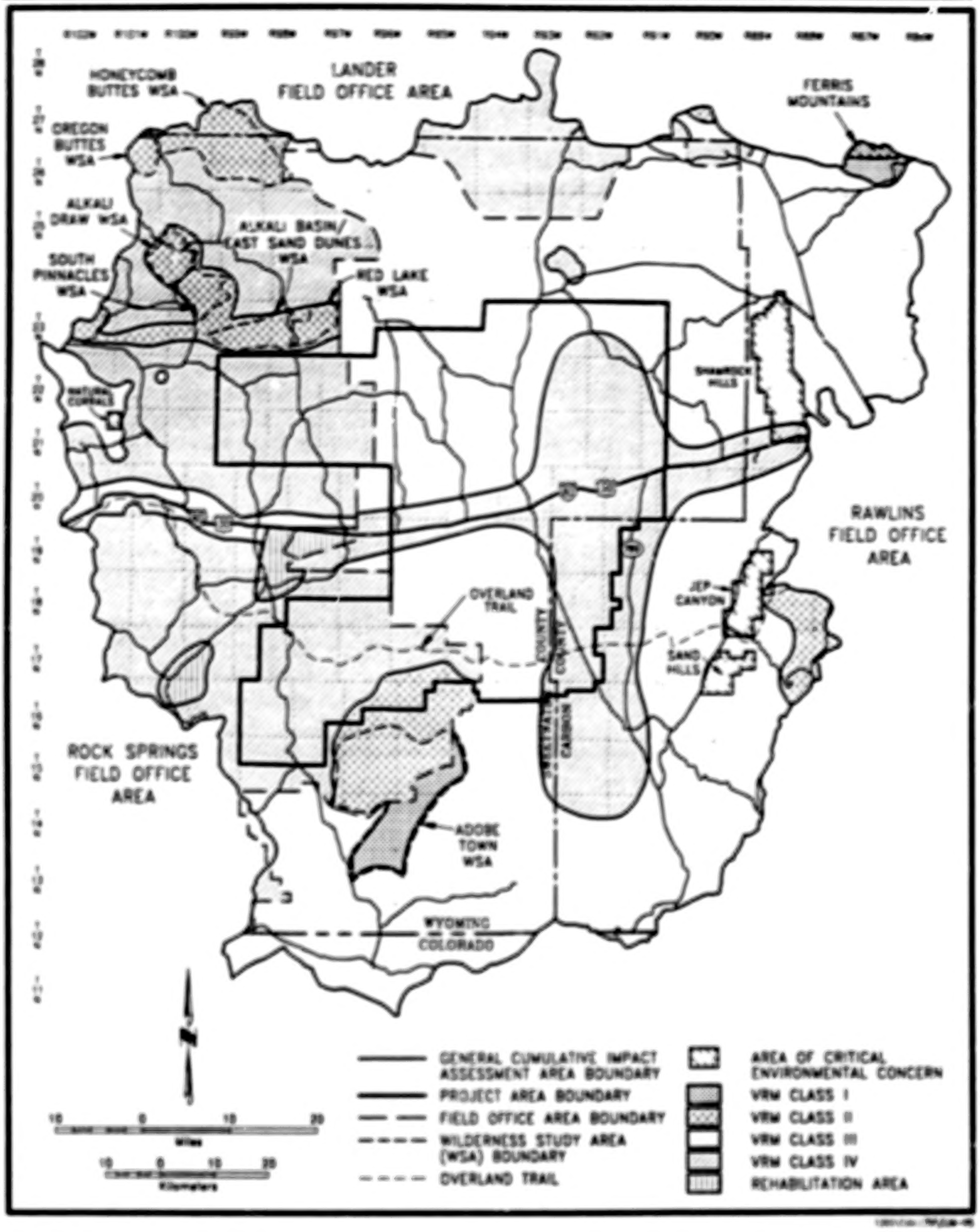
There are no VRM Class I lands in the CD/WIIPA. The closest VRM Class I area occurs approximately 6 mi south of the CD/WIIPA in the Adobe Town WSA in the BLM GDRA. Approximately 22,600 acres (2.1%) of the CD/WIIPA is designated as VRM Class II (see Map 3.16)--those areas where changes in any of the basic elements (form, line, color, or texture) caused by management activities should not be evident in the characteristic landscape. VRM Class II areas are considered SRAs (see Map 2.3). Approximately 439,100 acres (41.4%) of the CD/WIIPA is designated as VRM Class III--those areas where changes in the basic elements caused by management activities may be evident in the characteristic landscape, but should remain subordinate to the existing landscape character. The remainder of the CD/WIIPA (599,500 acres, 56.5%) is VRM Class IV--those areas where changes in the basic elements may subordinate the original composition and character of the landscape, but should reflect what could be a natural occurrence in the characteristic landscape. Rehabilitation areas, where the natural character of the landscape has been disturbed to a point where rehabilitation is needed to bring it up to one of the other four classifications, do not occur in the CD/WIIPA.

The most visually sensitive lands in the vicinity of the CD/WIIPA are WSAs adjacent to the CD/WIIPA and the Overland Trail segment, which crosses the southern portion of the CD/WIIPA (see Map 3.16). WSAs within the GRRA are VRM Class II, whereas the portion of the Adobe Town WSA in the GDRA is Class I. If a wilderness designation is made by Congress, the entire designated wilderness area would be reclassified to Class I (BLM 1987b; personal communication, June 1995, with Krystal Clair, BLM). Any portion of the WSA not classified as wilderness would be Class II or Class III, as appropriate, to be consistent with the adjacent areas.

A 0.25-mi buffer zone is provided adjacent to the Overland Trail to protect its visual integrity. No surface disturbance is allowed within 0.25 mi of contributing segments of this trail unless such disturbance is not visible from the trail or occurs in an existing visual intrusion area.

3.7 HAZARDOUS MATERIALS

Hazardous substances present in the CD/WIIPA include those used and produced in association with natural gas exploration, development, and production as shown in Appendix C. These substances are discussed in further detail in the Hazardous Materials Summary for this project (BLM 1998a), available for review at the BLM RFO and RSFO.



Map 3.16 Visual Resource Management Classes, Wilderness Study Areas, and Areas of Critical Environmental Concern Proximal to the Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

4.0 ENVIRONMENTAL CONSEQUENCES, MITIGATION, AND MONITORING

Environmental consequences of construction, drilling, completion, operation, and maintenance of the proposed Continental Divide/Wamsutter II Natural Gas Project are discussed below for each affected resource under each alternative. Discussions of impacts that can be reasonably expected from project implementation are included, and residual impacts are discussed where appropriate. Project-wide environmental protection and mitigation measures, presented in Section 2.6.13, are part of the Proposed Action and Alternatives A and B, and impact analyses assume that these mitigation measures would be effectively implemented. Additional mitigation measures are recommended for some resources to further minimize impacts. However, the BLM lacks authority to enforce these measures on private lands, and in the absence of these mitigation measures, impacts to many CD/WIIPA resources could be significant. Nonetheless, the Operators have committed to implementing the proposed project with public safety and environmental consciousness throughout the CD/WIIPA and for the LOP insofar as landowner preference and agreement allow.

An environmental consequence or impact is defined as a modification in the existing environment brought about by development activities. Impacts may be beneficial or adverse, may be a primary result of the action (direct) or a secondary result (indirect), and may be permanent or long-lasting (long-term) or temporary and of short duration (short-term). Impacts may vary in degree from only a slightly discernible change to a total change in the environment.

Short-term impacts are effects on the environment that occur during and immediately after the conclusion of construction, drilling, completion, and testing activities. Although short in duration, such impacts are normally obvious and disruptive. For this project, short-term impacts are defined as lasting 5 years or less. Long-term impacts are changes made in the environment during construction and operation of the project that remain longer than 5 years. Impacts that remain for the LOP and after reclamation has been accomplished would be considered long-term. The use of adjectives such as moderate, low, and negligible have been avoided because this EIS is an analytical document, not a decision document (BLM 1996b). The ROD for this project will be the decision document.

The mitigation and monitoring measures presented herein were proposed by Operators as components of their proposed project and/or were developed in response to identified impacts and measures proposed during the scoping process. Mitigation and monitoring measures describe how project activities may be implemented to further assure compliance with resource management goals and objectives for the CD/WIIPA, applicable lease stipulations, and additional environmental protection goals identified during IDT analyses. All mitigation and monitoring measures identified in this chapter and specified in the ROD for this project would become components of the Proposed Action, Alternative A, or Alternative B, unless otherwise indicated.

The BLM RFO and RSFO Managers would be the Authorized Officers for this project. Mitigation and monitoring measures may be modified by the Authorized Officers based on new information or to further minimize impacts. IDT recommendations would be developed during field site analyses, conducted during APD and ROW reviews, and presented to the Authorized Officer. Final mitigation and monitoring requirements would be determined by the Authorized Officer and specified in the ROD for this project.

Authorization to proceed with the implementation of this project on public lands would be contingent upon receiving from the Operators site-specific transportation (see Appendix B) and reclamation monitoring plans (see Appendix A) and USFWS concurrence on the T&E species impact analysis (see Appendix E). Site-specific plans would be developed when APD and ROW applications are received. Concurrent IDT on-site environmental reviews may also be conducted.

Approval of individual project components (i.e., wells, roads, pipelines, and ancillary facilities) for the CD/WIIPA would be contingent upon completion of a site-specific cultural resource file search and Class III cultural clearance, paleontological clearance, site-specific EAs, T&E species investigations, and Decision Records for each well, road, pipeline, or other facility unless otherwise provided by the Authorized Officer. Construction, operation, and monitoring plans may also be required before project approval would be granted for specific project development activities.

The Authorized Officer, in consultation with other agency personnel (e.g., WGFD, USFWS), would approve, on a case-by-case basis, the initiation of well location construction, drilling, completion, and production facility installation when sensitive resource constraints (e.g., wildlife) are involved. This action would allow project activities to proceed in areas and/or during periods of restriction if deemed appropriate by the Authorized Officer (e.g., mild winters, abandoned raptor nest sites, etc.). Exceptions would be granted when necessary to meet conservation and royalty requirements of the *Mineral Leasing Act* and the proposed development is acceptable with proper mitigation. CD/WIIPA Operators are encouraged to submit APDs and ROW applications for development activities on crucial winter ranges and in raptor nest and sage grouse lek/nesting buffers such that there is sufficient time to complete all activities prior to critical periods.

Mitigation and monitoring measures identified would be adhered to on federal lands and/or private lands affected by federal undertakings, subject to landowner preferences or agreements. Mitigation for cultural resources would be applied on all public lands and on private lands affected by federal undertakings, unless landowner denial for access is documented in writing.

All phases of the proposed project including well location, road, and pipeline construction, drilling and completion operations, maintenance, and reclamation would be conducted by the Operators and their subcontractors in full compliance with all applicable federal, state, and local laws and regulations and within the guidelines specified in approved APDs, ROW permits, and site-specific EAs and Decision Records (i.e., individual well location, road, pipeline, and ancillary facility EAs).

On federal lands and in conformance with onshore oil and gas orders, Operators would prepare and submit individual comprehensive drill site design plans for BLM approval. These plans would show the drill location layout over the existing topography, dimensions of the location, volumes and cross sections of cut and fill, location and dimensions of reserve pits, existing drainage patterns, and access road egress and ingress. Plans would be submitted and approved prior to initiation of construction.

Site-specific recommendations and mitigations would be developed based on IDT site inspections of each proposed development site by the Operators and the BLM or other landowner. Sites would include new roads and roads designated for improvement, well locations, pipelines, and ancillary facilities. The final location of each site would be specifically evaluated through the APD, ROW application, and site-specific EA and Decision Record processes. In addition, prior to the approval of any APD or ROW application, adequate reclamation plans for existing, unnecessary, on-lease disturbed areas would be required by the BLM.

Any proposed activity or surface disturbance (e.g., construction activities such as roads, well locations, pipelines, etc.) would be accompanied by appropriate engineering design specifications, geotechnical analyses, mitigation plans, etc. This information would be of sufficient detail to demonstrate that all environmental resources would be adequately protected or that impacts to them would be adequately mitigated.

The following areas or situations may require more detailed or complex designs, plans, or analyses:

- slopes in excess of 25%;
- areas within 500 ft of surface water and/or wetland areas;
- areas within 100 ft of ephemeral/intermittent drainages;
- areas on unstable soils, including stabilized dunes;
- construction with frozen material or during periods when soil materials is saturated or when watershed damage is likely to occur;
- construction activities in crucial wildlife habitats (e.g., crucial winter ranges, raptor nesting concentration areas);
- construction at sites where cultural or paleontological resources are present;
- construction in areas proximal to existing residences; and
- construction in VRM Class II areas.

Reclamation plans would be provided as components of APDs and ROW applications according to guidelines established in Onshore Oil and Gas Order No. 1 and other criteria established by the BLM (see Appendix A). These reclamation plans would detail all practices necessary for reclamation on areas not required for production operations (i.e., unused portions of well locations, outer portions of road ROWs, and entire pipeline ROWs outside road ROWs). Plans would include configurations of the reshaped topography and drainage systems, segregation of spoil materials, surface manipulations, waste disposal practices, soil treatments, and reclamation species lists and would incorporate the material applicable to reclamation presented in Appendix A. An estimate of the time for commencement and completion of reclamation operations would also be included. Similar reclamation plans would be prepared upon abandonment of production facilities.

Applicable lease stipulations developed or applied to CD/WIIPA activities would be adhered to during all proposed activities, unless a BLM-approved written exception has been granted. Exceptions would be granted only in cases where adherence to stipulations is not possible or necessary, and the proposed development is acceptable with proper mitigation. Public review of lease stipulation modification, waiver, or exception may be granted when deemed appropriate by the Authorized Officer. Lease stipulations may provide further mitigation and monitoring criteria that have not been identified in this EIS; these criteria would be addressed as specified above.

Each Operator may be required to have an individual to serve as Environmental Compliance Coordinator. The Environmental Compliance Coordinator would be responsible for assuring that mitigation measures are applied and monitoring activities are conducted as necessary to assure impacts are minimized.

Operators and the BLM would provide qualified representatives on the ground during construction to validate construction commensurate with the approved design.

The extent of project-required surface disturbance within the 1,061,200-acre CD/WIIPA is presented in Table 2.1. In summary, new disturbance resulting from the proposed project would total 22,400 acres initially and 8,300 acres for the LOP. The maximum total acreage within the CD/WIIPA required for the proposed project would be 33,600 acres initially, which includes 11,200 acres of existing disturbance. The LOP disturbance required for the proposed project would be 15,900 acres which includes 7,600 acres of existing disturbance. Total initial and LOP-required surface disturbance represents approximately 3.2% and 1.5% of the total acreage within the CD/WIIPA, respectively, and most quantifiable project-specific impact assessments are based on these acreages. The total area of surface disturbance required under Alternatives A and B would likely be similar to that of the Proposed Action; however, LOP surface disturbance under these alternatives may be reduced on federal lands in SRAs (see Map 2.3); the greatest potential reduction in LOP surface disturbance would be under Alternative A (see Table 2.2).

Linear disturbance has relatively more "edge" than other types of disturbance due to the high perimeter to interior area ratio associated with this type of disturbance. Edge, or the abrupt transition between two distinctly different areas (i.e., disturbed versus undisturbed), may magnify associated impacts to some resources (e.g., soils, vegetation, wildlife, visual resources). The existing and proposed linear disturbance within the CD/WIIPA and cumulative impact assessment areas is primarily associated with road, railroad, and pipeline ROWs. Approximately 67% of existing and proposed disturbance within the CD/WIIPA is linear, and about 70% of proposed LOP disturbance would be of this type (see Table 2.1).

Cumulative impacts are those that result from the incremental impacts of the proposed project added to past, present, and reasonably foreseeable future actions. Cumulative impact assessment areas vary between resources, and these areas were identified by the BLM IDT in response to scoping comments on this and other proposed regional oil and gas projects, as well as BLM guidelines for assessing cumulative impacts (BLM 1994c). Assessment area boundaries are based upon existing relevant landscape, resource, project, and/or jurisdictional delineations (e.g., hydrologic divides, herd units, project areas, counties). Table 4.1 identifies the cumulative impact assessment areas used for each resource, and Map 4.1 shows the locations of the General Cumulative Impact

Table 4.1 Cumulative Impact Assessment Areas, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Resource	Cumulative Impact Assessment Area[1]
Air Quality	Project-affected locations within southern Wyoming and northern Colorado (see Map 3.1)
Topography/Physiography	Project-affected watersheds within GCIAA
Geology (general)	
Mineral Resources	MCIAA
Geologic Hazards	CD/WIIPA
Paleontological Resources	CD/WIIPA
Soils	Project-affected watersheds within GCIAA
Water Resources	
Surface Water	Project-affected watersheds within GCIAA
Ground Water	Project-affected aquifers
Noise and Odor	CD/WIIPA and 1-mi buffer
Vegetation	
General	GCIAA
Wetlands/Riparian Areas	Project-affected watersheds within GCIAA
Wildlife and Fisheries	
Big Game	Entire winter and crucial winter ranges for project affected herds
Sage Grouse	Project-affected UGBMAs within GCIAA
Raptors	MCIAA and 1-mi buffer
Fisheries	Project-affected watersheds within GCIAA
Other Species	CD/WIIPA
Wild Horses	Project-affected WHHMAs within GCIAA
Threatened, Endangered, Candidate, and State Sensitive Species	GCIAA
Cultural Resources	CD/WIIPA and 1-mi buffer
Socioeconomics	Sweetwater and Carbon Counties
Land Use	
Agricultural/Rangeland	Project-affected allotments within GCIAA
Residential Areas	CD/WIIPA
Minerals Extraction	MCIAA
Recreation	GCIAA
Land Status and Prior Rights	CD/WIIPA
Visual Resources	GCIAA

[1] See Map 4.1 for locations:
GCIAA = General Cumulative Impact Assessment Area;
CD/WIIPA = Continental Divide/Wamsutter II Project Area;
MCIAA = Minerals Cumulative Impact Assessment Area.

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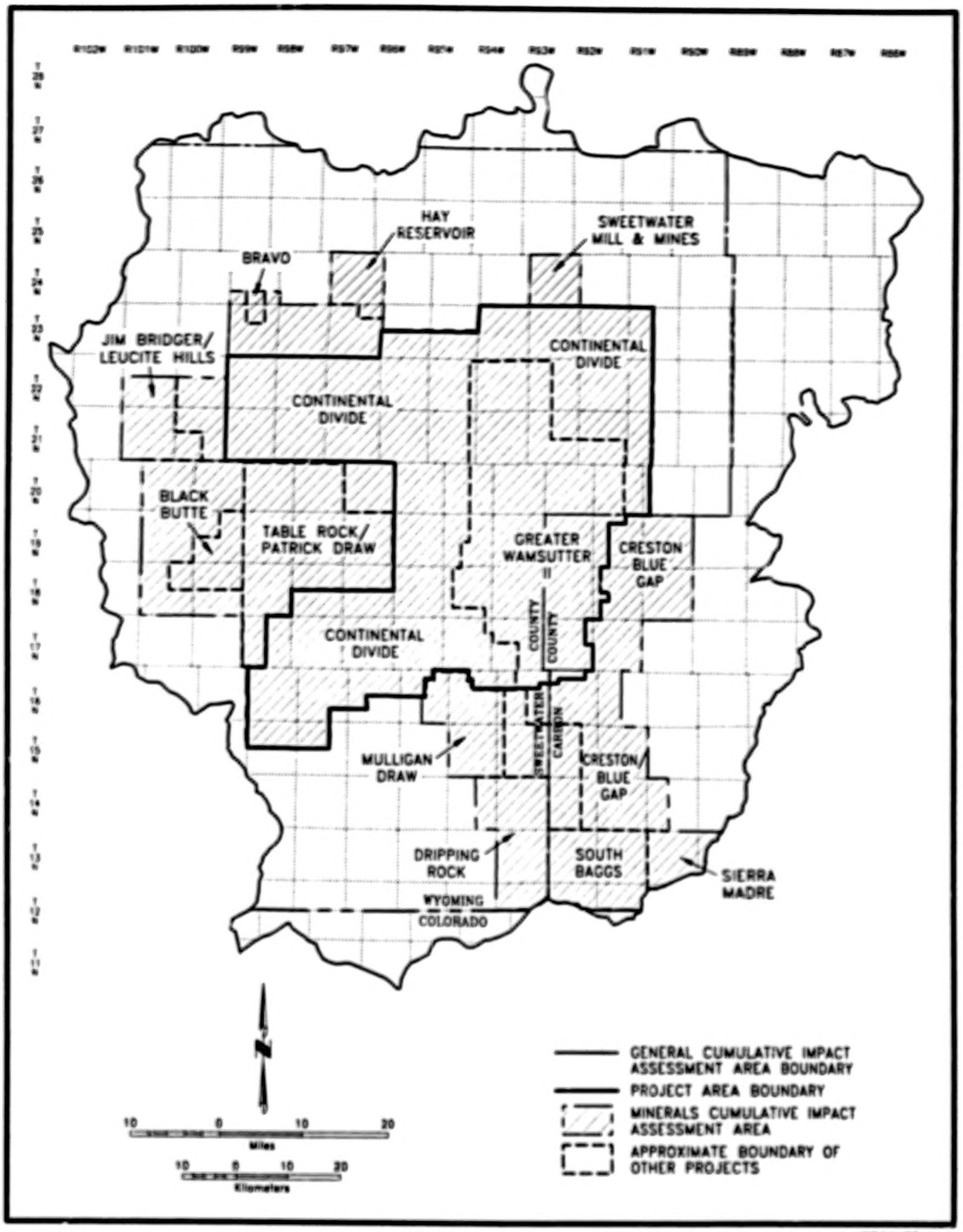

Map 4.1 **Cumulative Impact Assessment Areas, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.**

Assessment Area (GCIAA) and Minerals Cumulative Impact Assessment Area (MCIAA) for this project.

Past use of the CD/WIIPA has included wildlife habitat, livestock grazing, minerals development and production, recreation, and transportation. These uses continue through the present and are anticipated to continue into the reasonably foreseeable future. Assessment of cumulative impacts includes a quantification of existing surface disturbance within the CD/WIIPA and associated cumulative impact assessment areas. Existing surface disturbance was determined primarily from 1994 aerial photographs. Surface disturbance was defined as all paved (e.g., interstate, state, county) and unpaved (arterial, collector, local, resource, undeveloped/two-track) roads, oil and gas wellpads, unreclaimed or partially reclaimed pipeline corridors, mining operations, railroads, residential areas, reservoirs, cultivated lands, utility lines, and oil and gas ancillary facilities (Table 4.2). The size of disturbed areas associated with roads, pipelines, railroads, and utility lines was determined from aerial photography and was verified in the field. Existing surface disturbance estimates likely are overstated due to determination techniques which included classifying areas as disturbed where color and/or textural differences were noted on aerial photographs. Furthermore, existing oil-and-gas-related disturbance estimates include: some short-term disturbance acreages at well locations and along roads that were not reclaimed at the time aerial photographs were taken; some non-oil-and-gas features that appeared similar to well locations on aerial photographs; and some non-oil-and-gas roads since all unpaved roads (excluding two-tracks) not known to be county roads were considered oil and gas roads.

For areas where aerial photography was unavailable (<2% of the GCIAA), existing disturbance was calculated by extrapolating the percentage of disturbance determined from aerial photographs of surrounding areas and from 1:24,000 USGS maps. Total existing long-term disturbance within the CD/WIIPA, MCIAA, and GCIAA is 14,800 acres, 53,700 acres, and 86,100 acres, respectively (Table 4.2).

The MCIAA includes existing, approved, and/or proposed oil and gas developments and surface mining operations surrounding the CD/WIIPA and covers approximately 2,077,000 acres (Map 4.1). Oil and gas developments include the Creston/Blue Gap, Sierra Madre, South Baggs (proposed), Dripping Rock, Mulligan Draw, Table Rock/Patrick Draw, Hay Reservoir, and Bravo fields. Surface coal mines within the MCIAA are Black Butte, Leucite Hills, and Jim Bridger Mines. Other existing developments within the MCIAA include the Jim Bridger Power Plant and the Sweetwater Mill and Mines. Total existing disturbance within the MCIAA is approximately 53,700 acres, or 2.6% of the MCIAA (Table 4.2). Reasonably foreseeable future disturbance within the MCIAA as determined from extant NEPA documentation, mine permits, and personal communications with developers, is anticipated to be about 8,800 acres, with approximately 16% resulting from oil and gas development. Estimates of reasonably foreseeable future disturbance are for the LOP and therefore extend beyond RMP-identified planning periods for the RSFO area (BLM 1992, 1996a, 1997a) and RFO area (BLM 1987a, 1988b, 1990a). Total existing, proposed, and reasonably foreseeable future disturbance within the MCIAA is approximately 70,800 acres, or 3.4% of the MCIAA (Table 4.2).

The GCIAA covers about 4,490,000 acres and includes the CD/WIIPA, MCIAA, and additional surrounding areas (Map 4.1). The boundary of the GCIAA is based on hydrologic divides. Existing disturbance within the GCIAA totals 86,100 acres, or 1.9% of the area (Table 4.2), and includes all oil and gas developments, surface coal mines, roads, railroads, residential areas, impoundments, cultivated lands, utility lines, and other facilities. Reasonably foreseeable disturbance within the GCIAA includes all foreseeable disturbance within the MCIAA, as well as anticipated oil and gas exploration developments outside of the MCIAA. Areas within the GCIAA that are outside of the MCIAA are projected to be developed at a level and rate similar to what has occurred on the area in the past; therefore, reasonably foreseeable disturbance would be approximately 3,100 acres for the LOP (850 wells at 3.6 acres of associated long-term disturbance per well). Reasonably foreseeable disturbance throughout the entire GCIAA is about 11,900 acres, or 0.3% of the area (Table 4.2). Total existing, proposed, and reasonably foreseeable disturbance within the GCIAA is approximately 106,300 acres, or 2.4% of the area (Table 4.2). The 8,300 acres of LOP disturbance

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Table 4.2 Cumulative Disturbance, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.[1]

Location/Type of Disturbance	Total Acreage	Acreage of Disturbance: Oil and Gas[2]	Acreage of Disturbance: Oil and Gas Roads[3]	Acreage of Disturbance: Other[4]	Total Long-term Acreage Disturbed	% Disturbed[5]
Continental Divide/Wamsutter II Project Area (CD/WIIPA)	1,061,200					
Existing[6]		2,200	5,400	7,200	14,800	1.4
Proposed[7]		2,500	5,800	0	8,300	0.8
Total		4,700	11,200	7,200	23,100	2.2
Minerals Cumulative Impact Assessment Area (MCIAA)	2,077,000					
Existing[8]		13,300	17,500	22,900	53,700	2.6
Proposed [7]		2,500	5,800	0	8,300	0.4
Reasonably Foreseeable[9]		1,200	NQ[10]	7,600	8,800	0.4
Total		17,000	NQ[10]	30,500	70,800	3.4
General Cumulative Impact Assessment Area (GCIAA)	4,490,000					
Existing[11]		23,100	29,400	33,600	86,100	1.9
Proposed[7]		2,500	5,800	0	8,300	0.2
Reasonably Foreseeable[12]		4,300	NQ[10]	7,600	11,900	0.3
Total		29,900	NQ[10]	41,200	106,300	2.4

[1] Depicts cumulative LOP (30-50 years)/long-term disturbance which extends beyond the planning periods for the RSFO and RFO areas.

[2] Estimates are conservative (i.e., overestimate disturbance acreage) and may include: some non-oil-and-gas acreage derived from aerial photograph interpretations which used methodologies that included listing all features that appeared similar to well locations as well locations (e.g., water well sites, small stock tanks, and staging areas may be included); some short-term disturbance along roads and at well locations; and some adequately reclaimed areas where color and/or texture variations were noted on aerial photographs.

[3] Overestimates disturbance acreages since all unpaved roads (excluding two-track routes) not known to be county roads were considered oil and gas roads.

[4] Includes disturbance from surface mines, non-oil-and-gas roads, railroads, residential areas, impoundments, cultivated lands, utility lines, and other facilities.

[5] % Disturbed = Total Long-term Acreage Disturbed/Total Acreage of the area x 100.

[6] See Table 2.1 (i.e., existing disturbance less 2,500 acres of pipeline disturbance and approximately 1,100 acres of short-term well location disturbance; it is assumed this acreage would be adequately reclaimed for the LOP).

[7] Includes all new disturbance required for the LOP (see Table 2.1).

[8] Includes existing disturbance in CD/WIIPA.

[9] Includes authorized/proposed long-term disturbance (well locations, roads, ancillary facilities) from Creston/Blue Gap, Mulligan Draw, Bravo, Hay Reservoir, Sierra Madre, Dripping Rock, and South Baggs (proposed) oil and gas projects, as well as proposed disturbance from Jim Bridger, Leucite Hills, and Black Butte coal mines.

[10] NQ = not quantified; reasonably foreseeable disturbance from roads is included with oil and gas-related disturbance.

[11] Includes existing disturbance in MCIAA.

[12] Includes reasonably foreseeable disturbance in the MCIAA, plus disturbance from an additional 850 exploration wells and associated facilities (approximately 3.6 acres disturbance per well) outside the MCIAA but within the GCIAA. The number of exploration wells was estimated based on past oil and gas exploration activities in the area.

resulting from the Continental Divide/Wamsutter II Project represents approximately 0.2% of the entire GCIAA.

The No Action Alternative would require the BLM to deny approval of surface disturbance on federal lands associated with the Proposed Action and Alternatives A and B. Denial of the current development proposal is not, however, a denial of all natural gas development in the CD/WIIPA. For the purpose of this analysis, development of lands under the No Action Alternative in the CD/WIIPA are assumed to occur at levels similar to those that have occurred on the area in the past (see Table 2.1). In the absence of further CD/WIIPA development, no additional impacts to resources would occur (i.e., resource conditions would be as described in Chapter 3.0). However, under the No Action Alternative, impacts could be greater than those described for the Proposed Action and Alternatives A and B since proposed transportation, reclamation, and wildlife protection planning (see Appendices A, B, and D) and nonbinding applicant-committed measures (see Section 2.6.13) may not be implemented.

An assumed 6,400 acres of new initial surface disturbance and 2,400 acres of new long-term disturbance would occur under the No Action Alternative (see Table 2.1). With the inclusion of all existing surface disturbances on the CD/WIIPA, total new and long-term surface disturbance under the No Action Alternative would be 24,800 acres and 17,200 acres, respectively, and an estimated 50% of this disturbance would be on federally managed lands.

Impacts of the Proposed Action, Alternatives A and B, and the No Action Alternative and associated applicant-committed mitigation measures are summarized in Table 2.6 and discussed in detail below. Impacts are considered significant if they would result in the nonattainment of existing land use/management objectives or the inability of management agencies to obtain these objectives.

4.1 PHYSICAL RESOURCES

4.1.1 Air Quality

The BLM GDRA and GRRA RMPs (BLM 1990a, 1997a) and Standards for Healthy Rangelands (BLM 1997b) and state (WSLUC 1979) and local (THK 1977; UW 1991; Pedersen Planning Consultants 1997, 1998) land use plans address the following management objectives associated with air quality:

- to comply with all federal and state air quality laws, rules, regulations, and standards;
- to maintain and, where possible, enhance air quality; and
- within the scope of BLM's authority, to minimize emissions which may add to atmospheric deposition (acid rain) or reduce visibility.

The following analysis shows that no significant adverse direct and indirect impacts to air quality are anticipated from implementation of the Proposed Action or alternatives. Based on a separate assessment predicting potential future near-field (direct and indirect) air quality impacts (BLM 1999b), localized short-term increases in CO, NO_2, ozone, TSP, PM_{10}, and SO_2 concentrations would occur, but maximum concentrations would be well below applicable ambient air quality standards. Similarly, at the maximum assumed emission rates, predicted hazardous air pollutant (HAP) concentrations would be below the various 8-hr maximum acceptable ambient concentration levels (AACLs), and the related incremental cancer risks (to residences assumed to be located at least 1,650 ft [500 m] from a well site and 13,100 ft [4000 m] from the gas plant/compressor) would also be below applicable significance levels.

Potential air quality impacts from the Proposed Action and alternatives are analyzed and reported in the impact analyses sections below; however, this analysis is prepared solely under the requirements of NEPA, to assess and disclose "reasonably foreseeable" impacts to both the public and BLM decision-maker before a ROD is issued. Due to the preliminary nature of this NEPA air quality assessment, air quality analysis results are considered a "reasonable, but conservative" upper estimate of predicted impacts. Actual impacts at the time of development are likely to be less.

The air quality impact assessment is based on the best available engineering data and assumptions, meteorology data, and EPA dispersion modeling procedures. However, where specific data or procedures were not available, "reasonable, but conservative" assumptions were incorporated. For example, the Proposed Action air quality impact assessment assumed that all 3,000 natural gas wells would go into production (no dry holes) and operate at full production levels (no shut ins).

Potential air quality impacts were analyzed in order to determine maximum near-field (direct and indirect) ambient air pollutant concentrations and HAP impacts, as well as to determine maximum far-field (cumulative) ambient air pollutant concentrations, visibility, and atmospheric deposition (acid rain) impacts.

Air pollution impacts are limited by state and federal regulations, standards, and implementation plans established under the *Clean Air Act* and administered by the CDPHE-APCD and the WDEQ-AQD. State regulations require proposed air pollutant emission sources (including dehydrators, separators, gas compressors, and gas plant facilities) to undergo a permitting review before construction can begin. Therefore, the states have the primary authority to review emission permit applications and to require emission permits, fees, and control devices prior to construction and/or operation. In addition, the Congress (through the *Clean Air Act* Section 116) authorized local, state, and tribal air quality regulatory agencies to establish air pollution control requirements more (but not less) stringent than federal requirements. Additional site-specific air quality analysis would be performed, and additional emission control measures (including a BACT analysis and determination) may be required by the state to ensure protection of air quality resources.

In addition, under FLPMA and the *Clean Air Act*, the BLM can not conduct or authorize any activity which does not conform to all applicable local, state, tribal, and federal air quality laws, statues, regulations, standards, and implementation plans. An extensive air quality impact assessment document was prepared to analyze potential impacts from natural gas development in the CD/WIIPA and other "reasonably foreseeable" emission sources, and is available for review (BLM 1999b).

The state and national ambient air quality standards set maximum limits for several air pollutants, and PSD increments which limit the incremental increase of certain air pollutants above legally defined baseline concentration levels (see Table 3.6). Where legal limits have not been established, the BLM uses "best scientific" information to identify thresholds of significant adverse impacts. Thresholds have been identified for HAP exposures, incremental cancer risks, a "just noticeable change" in potential visibility impacts, and potential atmospheric deposition impacts to sensitive lake water chemistry. Specific threshold levels are described in the impact analyses sections below.

4.1.1.1 Proposed Action

No violations of applicable state or federal air quality regulations or standards are expected to occur as a result of direct or indirect project-specific air pollutant emissions (including construction and operation).

The EPA ISCST3 dispersion model was used with meteorological data measured during 1995 at Rock Springs (surface) and Lander (upper air), Wyoming, to predict maximum potential concentrations in the vicinity of the CD/WIIPA emission sources for comparison with applicable air quality standards and PSD Class II increments (BLM 1999b). The maximum predicted "near-field" air pollutant concentrations occur close to and between well locations and would occur so close to each well location that adding additional wells throughout the field would not increase the overall maximum concentration. This modeling was performed to quantify potential "reasonable, but conservative," TSP, PM_{10}, and SO_2 impacts during construction and CO, NO_2, ozone, and HAP impacts during operation, based on the individual pollutant's period of maximum potential emissions.

Construction emissions would occur during road and well pad construction, well drilling, and well testing. During well completion testing, natural gas would be burned (flared) for up to 3 days. Since the burned natural gas is "sweet" (does not contain sulfur compounds), no objectional odors are likely to occur.

Maximum potential particulate matter emissions, from traffic on unpaved roads and during well pad construction, were used to determine the maximum 24-hr TSP and PM_{10} concentrations, as well as annual average PM_{10} concentrations. Maximum air pollutant emissions from each well would be temporary (i.e., occurring during a 56-day construction period) and would occur in isolation, without significantly

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interacting with emissions from adjacent well locations. Particulate matter emissions from well pad and resource road construction would be minimized by application of water and/or chemical dust suppressants. The control efficiency of watering and/or dust suppressants was computed at 50%, at an (assumed) water application rate of 0.02 gallons per square yard every 4 hrs during construction.

The maximum potential particulate matter concentrations 650 ft (200 m) from the emission source (including representative background values) would be nearly 124 $\mu g/m^3$ (24-hr TSP), 55 $\mu g/m^3$ (24-hr PM_{10}), and 20 $\mu g/m^3$ (annual PM_{10}). Therefore, all predicted short- and long-term particulate matter concentrations would comply with the applicable 24-hr TSP WAAQS of 150 $\mu g/m^3$, and the 24-hr and annual PM_{10} NAAQS of 150 $\mu g/m^3$ and 50 $\mu g/m^3$, respectively. In addition, predicted particulate matter concentrations would decrease rapidly beyond 650 ft (200 m) from the emission source. Since these construction emissions are temporary, PSD increments are not applicable.

The predicted maximum 24-hr concentrations overestimate actual expected concentrations because the maximum modeled concentrations from the proposed activities are assumed to coincide with the second-maximum measured background concentrations. However, the meteorological conditions which lead to both situations would be very different and are not likely to occur at the same location and the same time.

The maximum short-term (3- and 24-hr) and long-term (annual average) SO_2 emissions would be generated by drilling rigs and other diesel engines used during rig-up, drilling, and completion operations (sulfur is a trace element in diesel fuel). These SO_2 emissions would be temporary, occurring only during the limited construction period at each well location. The maximum modeled concentrations (including representative background values) would be nearly 52 $\mu g/m^3$ (3-hr), 22 $\mu g/m^3$ (24-hr), and 6 $\mu g/m^3$ (annual). Therefore, all predicted short- and long-term SO_2 concentrations comply with the for SO_2 WAAQS of 1,300 $\mu g/m^3$, 260 $\mu g/m^3$, and 60 $\mu g/m^3$, respectively. The 24-hr and annual SO_2 NAAQS are less stringent. Since these emission sources are temporary in nature, PSD increments are not applicable.

Operation emissions would occur from increased compression requirements, the proposed gas processing plant, and fugitive emissions from 3,000 individual wells. It is anticipated that additional field-wide compression would be approximately 70,000 hp (20,000 hp located at the gas plant, and 10,000 hp at each of the five new compresser station locations) and that the proposed wells would limit total VOC emissions to less than 38 tons per year (tpy) (consistent with current WDEQ-AQD guidance).

Potential near-field air quality impacts during operations were predicted using a "reasonable, but conservative," well field "patch" with a geometric layout of eight wells and one gas plant with 20,000 hp of compression, based on the maximum assumed well location density of 8 wells/640-acre section.

The maximum direct CO impacts, which would occur due to compressor engine emissions throughout production, were predicted to be nearly 732 $\mu g/m^3$ (1-hr) and 531 $\mu g/m^3$ (8-hr). When these values are added to the assumed background concentrations, they become nearly 3,031 $\mu g/m^3$ (1-hr) and 1,679 $\mu g/m^3$ (8-hr), demonstrating compliance with the applicable CO WAAQS and NAAQS of 40,000 $\mu g/m^3$ (1-hr) and 10,000 $\mu g/m^3$ (8-hr).

Maximum NO_2 impacts during operations were predicted using "reasonably foreseeable" NO_x emission rates for individual wells and the compressor stations. The maximum potential "near-field" NO_2 concentrations were determined by multiplying maximum predicted NO_x concentrations by 0.75, in accordance with standard EPA (1995) methodology. The maximum predicted direct annual NO_2 impact was 21 $\mu g/m^3$, which is below the applicable annual PSD Class II increment of 25 $\mu g/m^3$. When this value is added to the assumed representative background concentration (10 $\mu g/m^3$), the resulting predicted maximum total impact of 31 $\mu g/m^3$ is also below the applicable NO_2 WAAQS and NAAQS of 100 $\mu g/m^3$ (annual). As stated previously, all NEPA analysis comparisons to the PSD Class II increments are intended to evaluate a "threshold of concern," and do not represent a regulatory "PSD Increment Consumption Analysis."

Ozone is formed in the atmosphere by a photochemical reaction involving ambient concentrations of VOC and NO_x. Because of this complex photochemical process, a specific ozone nomograph developed from the Reactive Plume Model was used to predict potential impacts (EPA 1988). This prediction method first computes a potential VOC to NO_x emission ratio, then uses the nomograph to compare this ratio to potential VOC emissions, ultimately predicting a potential ozone concentration.

At the predicted ratio (0.9:1), the nomograph estimated a maximum potential 1-hr ozone concentration increase of 0.018 parts per million (nearly 34 $\mu g/m^3$). When added to a background ozone concentration of 117 $\mu g/m^3$, the total predicted ozone impact would be 151 $\mu g/m^3$, which is below the restrictive ozone WAAQS of 160 $\mu g/m^3$. The ozone NAAQS is less stringent. This predicted impact is conservative since the nomograph was developed using urban meteorological conditions which are more conducive for forming ozone than those found in rural Wyoming.

Maximum HAP impacts during operations were predicted for individual well site dehydrator, separator, and storage tank emissions (benzene, toluene, ethyl benzene, xylene, and n-hexane) and the combination gas plant and 20,000 hp compression emissions (benzene, toluene, ethyl benzene, xylene, n-hexane, and formaldehyde). Since neither the State of Wyoming nor EPA have established HAP standards, predicted 8-hr HAP concentrations were compared to a range of 8-hr state maximum AACLs (EPA 1997a). These maximum predicted concentrations would occur close to the well and the gas plant/compressor station. Model receptors were located 100 m from individual wells and 100 m from the gas plant/compressor station boundary. As the distance from the emission source increases, the predicted concentrations decrease rapidly.

As summarized in Table 4.3, benzene and formaldehyde are the only pollutants predicted to exceed the lower end of the range of states' AACL.

Long-term (70-year) exposures from suspected carcinogenic emissions (e.g., benzene and formaldehyde) were used to estimate the individual cancer risk at the nearest residence (1,650 ft [500 m] from a well site and 13,100 ft [4,000 m] from the gas plant/compressor). These were calculated from EPA (1997b) unit risk factors for carcinogenic constituents. Two estimates of cancer risk were made; one that corresponds to a most likely exposure (MLE) condition, and one reflective of the maximally exposed individual (MEI). The estimated cancer risks were adjusted to account for duration of exposure and time spent at home.

Under the MLE scenario, the estimated individual and total cancer risks associated with long-term exposure to benzene (from individual well and gas plant/compressor operation) and formaldehyde (from compressor engine operation) are below 1 x 10^{-6} (0.4 x 10^{-6} and 0.4 x 10^{-6} individually and 0.9 x 10^{-6} total combined). Under the MEI analysis, the individual cancer risks for benzene (1 x 10^{-6}) and formaldehyde (1 x 10^{-6}) and the total combined cancer risk for the inhalation pathway (3 x 10^{-6}) all fall at the lower end of the 1 x 10^{-6} to 100 x 10^{-6} threshold range. Therefore, the long-term cancer risk analyses indicate no potential for concern. Given the conservative nature of these analyses, the predicted exposures are likely to overstate actual exposures.

In reviewing the predicted impacts described above, it is important to understand the "reasonable, but conservative" assumptions made regarding resource development. In developing this analysis, the ultimate level of development is uncertain (i.e., number of wells, equipment to be used, specific locations, etc.). The analysis was also based on a "reasonably foreseeable" development scenario, including several conservative assumptions.

- Maximum background criteria air pollutant concentrations (either measured or modeled) anywhere in the region were assumed to occur at all locations throughout the LOP, except ozone, which used the top tenth percentile maximum 1-hr value (July), rather than the absolute maximum concentration.
- All potential natural gas wells were assumed to become fully operational (no dry holes), and remain operating (no shut ins) throughout the LOP.
- The proposed natural gas compression (70,000 hp) was assumed to operate at maximum capacity continuously throughout the LOP (no phased increases or reductions). In reality: natural gas compression equipment would be added or removed incrementally as required by the well field operation; compressor engines would ope.

Table 4.3 Hazardous Air Pollutant Modeling Results, Acute Exposures, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999[1].

Pollutant	Modeled 8-hr Concentrations	Range of State AACL[2]
Individual well emissions		
Benzene	194.0	30_{FL07} - 714_{NV01}
Toluene	175.3	$1{,}870_{\text{IN03}}$ - $8{,}930_{\text{NV01}}$
Ethyl benzene	9.7	$4{,}340_{\text{ND01}}$ - $43{,}500_{\text{VT01}}$
Xylene	240.0	$2{,}170_{\text{IN01}}$ - $10{,}000_{\text{NV01}}$
N-hexane	911.3	$1{,}800_{\text{FL07}}$ - $36{,}000_{\text{CT01}}$
Formaldehyde	n/a	4.5_{FL07} - 71_{NV01}
Gas plant/compression emissions		
Benzene	34.4	30_{FL07} - 714_{NV01}
Toluene	25.4	$1{,}870_{\text{IN03}}$ - $8{,}930_{\text{NV01}}$
Ethyl benzene	8.2	$4{,}340_{\text{ND01}}$ - $43{,}500_{\text{VT01}}$
Xylene	12.3	$2{,}170_{\text{IN01}}$ - $10{,}000_{\text{NV01}}$
N-hexane	3.9	$1{,}800_{\text{FL07}}$ - $36{,}000_{\text{CT01}}$
Formaldehyde	63.0	64.5_{FL07} - 71_{NV01}

[1] Source: EPA (1997a) measured as μg/m³.

[2] AACL = Acceptable Ambient Concentration Levels
CT01 = Connecticut, Department of Environmental Protection, Air Compliance Unit
FL07 = Florida, Pinellas County Air Pollution Control Board
IN01 = Indiana Department of Environmental Management
IN03 = Indiana, Indianapolis Air Pollution Control Division
ND01 = North Dakota Department of Health, Division of Environmental Engineering
NV01 = Nevada Division of Environmental Protection, Air Quality Control
VT01 = Vermont Department of Environmental Conservation, Air Pollution Control Division

below full horsepower ratings; and it is unlikely all compressor stations would operate at maximum levels simultaneously.

- Total predicted short-term air pollutant impact concentrations were assumed to be the sum of the maximum background concentration, plus the maximum cumulative modeled concentrations, which actually occur under very different meteorological conditions and are not likely to coincide.
- The VOC and HAP analyses assumed all equipment would operate simultaneously at the maximum emission levels continuously throughout the LOP.
- The physical geometry of the PM_{10} analysis was modeled 36 times (each at a different 10 degree sector) in order to identify the maximum possible impact orientation.

Based on these numerous "reasonable, but conservative" analysis assumptions, which may actually compound one another, the projected impacts represent an upper estimate of the potential air quality impacts which are unlikely to actually be reached. However, even with the application of these "reasonable, but conservative" analysis assumptions, all predicted impacts are below applicable regulatory limits.

It is important to note that before actual development could occur, the WDEQ-AQD would review specific air pollutant emissions preconstruction permits which examine potential project-wide air quality impacts. As part of these permits (depending on source size), WDEQ-AQD could require additional air quality impacts analyses or mitigation measures. Thus, as development occurs, additional site-specific air quality analyses would be performed to ensure protection of air quality resources.

4.1.1.2 Alternative A

Predicted air quality impacts would be the same as described for the Proposed Action.

4.1.1.3 Alternative B

Predicted air quality impacts would be the same as described for the Proposed Action.

4.1.1.4 No Action

Impacts to air quality under the No Action Alternative would occur at allowable levels, and no significant impacts are anticipated. Implementation of the No Action Alternative could involve the development of approximately 845 wells; therefore, impacts are anticipated to be less than those of the Proposed Action and Alternatives A and B. In the absence of further development in the CD/WIIPA, no additional direct project impacts to air quality would occur.

4.1.1.5 Mitigation and Monitoring

Applicant-Committed Measures

- All BLM conducted or authorized activities (including natural gas development alternatives) must comply with applicable ambient air quality regulations and standards. Operators would adhere to all applicable Wyoming Ambient Air Quality Standards (WAAQS), National Ambient Air Quality Standards (NAAQS), and permit requirements (including preconstruction, testing, and operating permits) motorized equipment and other regulations, as required by the WDEQ-Air Quality Division (AQD).
- Operators would not allow open burning of garbage or refuse at well locations or other facilities in the CD/WIIPA. Any other open burning would be conducted under the permitting provisions of Section 13 of the Wyoming Air Quality Standards and Regulations (WDEQ-AQD 1989).
- On federal land, and during times of high use (i.e., construction, drilling, and workover operations), Operators would initiate immediate abatement of fugitive dust (by application of water, chemical dust suppressants, or other measures) when air quality, soil loss, or safety concerns are

identified by the BLM or the WDEQ-AQD. These concerns include but are not limited to potential exceedances of applicable air quality standards. The BLM would approve control measures, locations, and application rates. If watering is the approved control measure, Operators would obtain the water from state-approved sources.

Additional Potential BLM-Required Measures

Roads and well locations constructed on soils susceptible to wind erosion could be appropriately surfaced to reduce the amount of fugitive dust generated by traffic or other activities, and dust inhibitors (i.e., surfacing materials, nonsaline dust suppressants, water, etc.) could be used as necessary on unpaved collector, local, and resource roads which present a fugitive dust problem. To further reduce fugitive dust, Operators could establish and enforce speed limits (15-30 mph) on all project-required roads in and adjacent to the CD/WIIPA.

The air quality impact assessment also evaluated potential NO_x mitigation measures to further reduce NO_x emissions for natural gas-fired, internal combustion, compressor engines. The evaluation was not intended to rank or identify a required technology for the proposed compressors; the appropriate level of control would be determined and required by the WDEQ-AQD during the preconstruction permit process. In developing the emission inventory for the air quality impact assessment, it was assumed that compressor engines would have an average potential NO_x emission rate of approximately 2 grams per horsepower-hour (g/hp-hr) of operation. This reflects emission control levels which have already been required in similar applications, although WDEQ-AQD operating permit records have shown existing facility hourly emission levels to be substantially less. Alternate NO_x control measures include the following.

- Reduced Compression Requirements. Reducing the need for LOP compression by installing larger pipelines.
- Nonselective Catalytic Reduction. This control technology is applicable to relatively new engines and requires the installation of catalysts in the engine exhaust. The catalyst removes between 80 and 90% of the uncontrolled NO_x emissions, for an operating emission rate of 1-5 g/hp-hr.
- Lean Combustion. This technology involves the increase of the air-to-fuel ratio to lower the peak combustion temperature, thus reducing the formation of NO_x (new engines and retrofit applications). The controls are between 80 and 90% efficient, for an operating emission rate of 1.5-4.0 g/hp-hr.
- Selective Catalytic Reduction. This is a post-combustion control technology which is only applicable to exhaust streams with significant oxygen content (a lean burn engine). The controls are between 80 and 90% efficient, for an operating emission rate of 1.0-2.5 g/hp-hr.
- Electric Compression (Including Solar Power). Using electric-powered compressor motors in place of the typical natural gas-fired compressor engines could eliminate direct NO_x emissions from compressor station locations. However, increased NO_x emissions are likely to occur at the point of electrical generation, often burning "dirtier" fuels and emitting more air pollutants (such as from coal-fired power plants). Photovoltaic (solar) electrical systems can not provide the needed power requirements for proposed gas compression levels (70,000 hp).

The following potential mitigation measures could also be considered to further reduce potential air quality impacts.

- Centralized Well Gas Processing. To reduce VOC emissions, untreated gas from four or more wells could be transported by pipeline to a single central collection/treatment battery (separator and dehydrator units), although total emission levels may not be substantially reduced.
- Well Gas Flaring. Additional control of flashing VOC emissions from condensate storage facilities, such as flaring, could be required, although other pollutant emissions (such as CO and NO_x) are likely to increase.

- Re-injection of Well Gases. Vent stream gases from well-site processing could be compressed to reservoir pressure then re-injected into the natural gas formation, essentially eliminating direct vent stream emissions. Typical vent stream emissions consist primarily of CO_2 but can contain small amounts of VOC and trace gases. However, additional air pollutants (e.g., CO and NO_x) would be emitted by operation of the re-injection compressor engines.

- Natural Gas-Powered Drilling Rigs. The theoretical use of natural gas-fired engines to power drilling rigs, mud pumps, and associated equipment, rather than diesel-powered equipment, is technically feasible to reduce PM_{10}, SO_2, and VOC emissions. However, such equipment is not commercially available.

In addition to these technology-based potential mitigation measures, there are natural resource management actions which could reduce potential air quality impacts. Several of these "mitigation measures" are outside the jurisdiction of the BLM's management authority.

- Suspend Future Development Until Air Quality Issues Are Resolved. Previous NEPA document commentors have suggested the BLM "reconsider future development after more information is gathered," such as a PSD Increment Consumption Analysis. The BLM can deny an individual APD only under very specific legal conditions. However, WDEQ-AQD (the primary air quality regulatory agency) would review potential air pollutant emission sources and issue any applicable emission permits prior to construction and operation. Without WDEQ-AQD approval, the natural gas leases can not be developed.

- Withdraw or Prohibit Future Leasing. Previous NEPA document commentors have suggested the BLM "withdraw or don't offer leases," apparently to eliminate natural gas development and related air pollutant emissions. However, once the Department of the Interior has issued a valid mineral lease, it may be conditioned, but not revoked. Similarly, under current federal mineral law, future leasing can be prohibited only in specific legal circumstances. The U.S. Congress could revise these laws, but the prospect of securing passage of such legislation and appropriation of funds for that specific purpose is extremely remote. In addition, elimination of natural gas leasing is inconsistent with Congressional direction (through the *Clean Air Act*) for development and promotion of alternative clean fuels needed to improve air quality nationally.

- NO_x Emissions "Cap and Trade". Previous NEPA document commentors have suggested the BLM consider NO_x emissions trading, thereby limiting NO_x emissions to current levels. Existing NO_x emission facilities could then either keep, trade, or sell their emission allocations (essentially a property right to pollute) to other groups seeking to increase their NO_x emissions. When coupled with "banking" (holding, but not using credits) and "discounting" (reduced emission credit values with each "trade"), overall NO_x emissions would decrease. Under the *Clean Air Act*, the U.S. Congress has already established an "allowance program" for certain SO_2 emitting facilities, and Congress could establish a similar NO_x trading program to be implemented by WDEQ-AQD or EPA.

- BACT on Existing VOC Sources. Previous NEPA document commentors have suggested the BLM require retrofitting BACT devices on existing VOC emission sources to reduce overall VOC levels. Given the "technology-forcing" nature of BACT requirements, newer facilities are much cleaner than previously permitted air pollutant emitting facilities. However, only WDEQ-AQD or EPA have the statutory authority to regulate existing air pollutant emission sources, and even their authority is limited by law.

- Phased (Staged) Development. Previous NEPA document commentors have suggested the BLM reduce the intensity of natural gas development, such as limiting the "number of

> wells or ... amount of emissions until reach[ing] 0.5 deciview." The BLM does not have the authority to require that development of existing leases be limited when specified emissions levels are reached. However, as previously required in the Moxa Arch, Fontenelle, and Jonah II RODs, the BLM may establish an overall air pollutant emissions "level of concern" at a point where re-evaluation would occur, providing timely management review and ensuring compliance with the mandate to protect AQRVs through participation in WDEQ-AQD preconstruction permitting.

In addition to these potential mitigation measures, the BLM could continue to cooperate with existing visibility and atmospheric deposition impact monitoring programs. The need for, and the design of, additional monitoring could include the involvement of the Interagency Committees on Air Quality (including the Southwest Wyoming Technical Air Forum and the EPA Region VIII Federal Leadership Forum). Based upon the recommendations of the committees, Operators could be required to cooperate in the implementation of a coordinated air quality monitoring program. Oil and gas lease terms (Section 6) require the lessee, within the lease rights granted, to take measures deemed necessary by the lessor for the conduct of operations in a manner that minimizes adverse impacts to air quality, as well as other resources.

The BLM, in cooperation with WDEQ-AQD, could continue to track total NO_x emissions. Tracking total NO_x emissions requires close coordination between federal land management and state environmental regulatory agencies regarding receipt of applications for NO_x emitting sources and maintenance of a NO_x emissions inventory. The BLM and WDEQ-AQD have previously agreed to cooperate in the monitoring and tracking of NO_x emission levels within the Rock Springs District (including the Moxa Arch, Fontenelle and Jonah II projects) and to share data with each other (and other interested parties) when requested, as defined in an existing written agreement between the BLM's RSFO Manager and the WDEQ-AQD Director.

4.1.1.6 Cumulative Impacts

Based on a separate assessment predicting potential future far-field (cumulative) air quality impacts (BLM 1999b), the EPA CALMET/CALPUFF dispersion model was used to predict maximum potential air quality impacts at sensitive downwind PSD Class I and Class II areas to: 1) determine if the PSD Class I and II NO_2 increment might be exceeded; 2) calculate potential nitrate and sulfate atmospheric deposition (and their related impacts) in sensitive lakes; and 3) predict potential impacts to regional visibility.

Meteorological information was assembled to characterize atmospheric transport and dispersion from several 1995 data sources, including: 1) 20-km gridded MM5 (mesoscale model) values with continuous four-dimensional data assimilation; 2) hourly surface observations (wind speed, wind direction, temperature, cloud cover, ceiling height, surface pressure, relative humidity, and precipitation) measured at 22 locations; and 3) twice-daily upper air vertical profiles (wind speed, wind direction, temperature, and pressure) measured at five locations.

Potential "reasonable, but conservative" air pollutant emissions from the Continental Divide/Wamsutter II and South Baggs projects (proposed projects) were combined with other "reasonably foreseeable" facilities (which are not represented by the measured "background" values) to determine the total potential cumulative air quality impacts. These other "reasonably foreseeable" facilities included development associated with: 1) 11 recent NEPA analyses (Moxa, Fontenelle, Jonah, Cave Gulch, Carbon Basin, Cooper Reservoir, Creston/Blue Gap, Greater Wamsutter I, Stagecoach, BTA Bravo, and Mulligan Draw); 2) approximately 180 emission sources permitted by the WDEQ-AQD since 1994; 3) approximately 10 emission sources permitted by the CDPHE-APCD since 1994; 4) approximately 820 wells recently listed by the WOGCC, and 5) approximately 100 wells recently listed by the Colorado Oil and Gas Conservation Commission.

As shown in Table 4.4, cumulative direct project NO_2 impacts would be well within applicable PSD Class I and II increments at all sensitive areas. This

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Table 4.4 Predicted Direct Project NO_2 PSD Class I and II Sensitive Receptor Impacts, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.[1]

Location	Direct Project Sources	PSD Increment
PSD Class I Sensitive Areas		
Bridger Wilderness	0.001	2.5
Fitzpatrick Wilderness	<0.001	2.5
Mount Zirkel Wilderness	0.01	2.5
Rawah Wilderness	0.004	2.5
PSD Class II Sensitive Areas		
Adjacent to CD/WII Projects	21.2	25
Adjacent to South Baggs Project	1.8	25
Dinosaur National Monument	0.008	25
Popo Agie Wilderness	0.001	25
Savage Run Wilderness	0.008	25
Wind River Roadless Area	<0.001	25

[1] Measured as $\mu g/m^3$.

comparison is not a complete PSD increment consumption analysis, but an assessment indicating that the increment would not be exceeded by the cumulative emission sources. Many of the potential air pollutant emission sources were analyzed at their maximum permitted levels; actual emissions and their related air quality impacts are typically less. At the time of a preconstruction air quality permit application, the WDEQ-AQD may require a more detailed PSD Increment Consumption Analysis. Since PM_{10} and SO_2 construction emissions are temporary, their PSD increments are not applicable.

Several lakes were identified by the USFS as those which are sensitive to atmospheric deposition and for which the most recent and most complete data have been collected. The USFS, Regions 2 and 4 (Blett 1999), has also identified the following "Limit of Acceptable Change" regarding potential changes in lake chemistry for the PSD Class I and II sensitive receptors analyzed: no more than a 10% change in acid neutralizing capacity (ANC) for those water bodies where the existing ANC is at or above 25 microequivalents per liter ($\mu eq/l$) and no more than a 1 $\mu eq/l$ change for those extremely sensitive water bodies where the existing ANC is below 25 $\mu eq/l$. Using USFS-recommended procedures (Fox et al. 1989), Table 4.5 demonstrates that potential impacts to sensitive lakes would be well below applicable significance thresholds, both from the proposed project sources directly and from all potential cumulative sources combined.

Since the proposed project and cumulative emissions constitute many small sources uniformly spread out over a large area, discrete visible plumes are not likely to impact the PSD Class I and II sensitive receptors, but the potential for cumulative visibility impacts (increased regional haze) is a concern. Regional haze degradation is caused by fine particles and gases scattering and absorbing light. Potential changes to regional haze are calculated in terms of a perceptible "just-noticeable change" (1.0 deciview) in visibility when compared to measured background conditions.

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Table 4.5 Predicted Change in Acid Neutralizing Capacity in PSD Class I and II Area Sensitive Lakes (Percent Change), Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Location	Minimum ANC (μeq/l)	Project Sources	Cumulative Sources	Thresholds
PSD Class I Sensitive Areas				
Bridger Wilderness				
Deep Lake (2.7-year turnover)	**81.8**	**<0.1**	**0.8**	**10**
Mount Zirkel Wilderness				
Pothole A-8	**14.2**	**0.3**	**1.4**	**7.0**[1]
Seven Lakes	**30.0**	**0.2**	**0.9**	**10**
Upper Slide Lake	**22.6**	**0.2**	**0.9**	**4.4**[1]
Rawah Wilderness				
Island Lake	**64.6**	**<0.1**	**0.3**	**10**
No. 4 Lake	**43.5**	**0.1**	**0.5**	**10**
PSD Class II Sensitive Areas				
Medicine Bow National Forest				
West Glacier Lake	**29.7**	**0.4**	**3.9**	**10**
Popo Agie Wilderness				
Lower Saddlebag Lake	**66.1**	**<0.1**	**0.5**	**10**

[1] **For lakes with minimum existing ANC values <25 μeq/l, the threshold of concern is less than a 1 μeq/l reduction below the minimum existing ANC value (e.g., for Pothole A-8 in the PSD Class I Mount Zirkel Wilderness Area, 0.070 x 14.2 μeq/l equals 1 μeq/l).**

The Interagency Workgroup on Air Quality Modeling (IWAQM) has prepared a methodology for estimating changes to regional haze (IWAQM 1993). This method involves modeling NO_2, PM_{10}, and SO_2 emissions to estimate airborne fine particle concentrations at a PSD Class I or II sensitive area, then computing an increase in the extinction coefficient (interpreted as a deciview change) in addition to "clear" (90th percentile) measured background conditions.

A 1.0 deciview change is considered potentially significant as adopted by the Grand Canyon Visibility Transport Commission and reported in Pitchford and Malm (1994). A 1.0 deciview change is defined as about a 10% change in the extinction coefficient, which is a small but perceptible scenic change under many circumstances. The 1.0 deciview value corresponds to a 2 to 5% change in contrast, for a "black target" against a clear sky, at the most optically sensitive distance from an observer. Factors such as the magnitude of deciview change, frequency, time of the year, and the meteorological conditions during times when deciview thresholds are above 1.0 (as well as inherent conservatism in the modeling analyses) should all be considered when determining the significance of potential impacts.

A conservative visibility screening level analysis indicated that proposed project operations might result in a perceptible (1.0 deciview) visibility reduction on very clear days at several of the PSD Class I and II sensitive receptors; therefore, a more refined potential visibility impact analysis was performed. The more refined analysis calculated potential hourly fine particulate (PM_{10}, sulfate, and nitrate) impacts from the proposed project operations (including direct, No Action, and total cumulative sources) at sensitive areas; compared these predicted impacts with representative hourly measured optical conditions; and reported both the frequency and magnitude of calculated daily "just-noticeable changes" in visibility. For the Bridger, Fitzpatrick, and Popo Agie Wilderness Areas and the Wind River Roadless Area, hourly optical data collected at the Bridger PSD Class I IMPROVE monitor were used to define background conditions. For the Mount Zirkel, Rawah, and Savage Run Wilderness Areas and Dinosaur National Monument, hourly optical data collected at the Rocky Mountain National Park PSD Class I IMPROVE monitor were used to define background conditions.

As shown in Table 4.6, the refined visibility impact analysis predicted that a "just-noticeable change" greater than 1.0 deciview would occur on a single day at only the PSD Class I Rawah Wilderness Area. This predicted impact would not occur from the project sources or the No Action sources alone, but from all sources combined (total cumulative sources).

In addition, the USFS, Regions 2 and 4 (Blett 1999), has also identified the following "Limit of Acceptable Change" regarding potential significant visibility impacts for the PSD Class I and II sensitive areas analyzed: no day greater than 0.5 deciview, calculated on a 24-hr basis. Based on this more restrictive one half of a "just-noticeable change" level, cumulative operations would exceed the USFS "Limit of Acceptable Change" on a single day at both the PSD Class I Rawah Wilderness Area (1.68 deciview) and the PSD Class II Savage Run Wilderness Area (0.67 deciview). These predicted impacts would not occur from the project sources or the No Action sources alone, but from all sources combined (total cumulative sources).

In reviewing these predicted cumulative impacts, it is important to understand the "reasonable, but conservative" assumptions made regarding potential resource development.

For example, there is uncertainty regarding ultimate development (i.e., number of wells, equipment to be used, specific locations). The analysis was also based on a "reasonably foreseeable" development scenario, including several conservative assumptions.

- All existing background emission sources were assumed to operate at their existing emission rates continually (no reductions or closures) throughout the LOP. Recently, NO_x emissions from existing sources in southwestern Wyoming have been decreasing.

- All potential natural gas wells were assumed to become fully operational (no dry holes), and remain operating (no shut ins) throughout the LOP.

- All cumulative emission sources were assumed to operate at their "reasonably foreseeable" maximum emission rates simultaneously throughout the LOP. Given the large number of sources included in this analysis, the co-probability of such a scenario actually occurring over an entire year (or even 24 hrs) is extremely small. While this assumption is typically used in modeling analyses, the predicted impacts will be overstated.

- The proposed natural gas compression (70,000 hp for the Continental Divide/Wamsutter II Projects and 3,000 hp for the South Baggs Project) was assumed to operate continuously throughout the LOP (no phased increases or reductions). In reality, natural gas compression equipment would be added or removed incrementally as required by well field operations.

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Table 4.6 Predicted Visibility Impacts in PSD Class I and II Sensitive Areas, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.[1]

Location	Direct Project Sources	No Action Sources	Total Cumulative Sources
PSD Class I Sensitive Receptors			
Bridger Wilderness	0	0	0
Fitzpatrick Wilderness	0	0	0
Mount Zirkel Wilderness	0	0	0
Rawah Wilderness	0	0	1[2]
PSD Class II Sensitive Receptors			
Dinosaur National Monument	0	0	0
Popo Agie Wilderness	0	0	0
Savage Run Wilderness	0	0	0
Wind River Roadless Area	0	0	0

[1] Number of days above a "just-noticeable change."

[2] All cumulative sources combined were predicted to cause a 1.68 deciview change at the PSD Class I Rawah Wilderness Area boundary on a single day (based on June 4, 1995, meteorology and Rocky Mountain National Park IMPROVE optical data). However, this predicted visibility impact may be an artifact of the modeling analysis, where distant hourly optical conditions are assumed to occur simultaneously in each sensitive receptor.

- The atmospheric deposition impact analysis assumed no other ecosystem components would affect lake chemistry for a full year (assuming no chemical buffering due to interaction with vegetation or soil materials).

- The atmospheric deposition impact analysis also assumed only precipitation water would enter Deep Lake (PSD Class I Bridger Wilderness Area) for an entire 2.7 years, assuming the natural watershed would behave like a water sample in a laboratory "beaker," without stream-water entering or leaving the lake for nearly 3 years.

- The visibility impact analysis assumed a 1.0 deciview "just- noticeable change" would be a reasonably foreseeable significant adverse impact, although there is no applicable state or federal regulatory visibility standard.

Based on these numerous "reasonable, but conservative" analysis assumptions, which may actually compound one another, the projected impacts represent an upper estimate of potential air quality impacts which are unlikely to actually be reached.

The following additional assumptions could lead to an underestimation of potential impacts, but are beyond the scope of this cumulative air quality impact assessment for predicting "reasonably foreseeable significant adverse effects on the human environment."

- Inclusion of the Pinedale Anticline Project in the cumulative analysis. The Pinedale Anticline project proposal was specifically not included in the cumulative air quality impact analysis as a "reasonably foreseeable" development because of its unsettled speculative status at the time the cumulative analysis was initiated. What may actually be authorized for development was unknown. No WDEQ-AQD air pollutant emission permits have been issued for the proposed Pinedale Anticline activities. Thus, to include the proposed project would mislead the public and the BLM decision-maker with unsupportable estimates of cumulative effects on the resources, ecosystems, or human communities. The BLM has developed the Pinedale Anticline air quality impact assessment protocol through its "stakeholder" process, and it is clear the Pinedale Anticline cumulative air quality impact assessment will consider including the Continental Divide/Wamsutter II project, if authorized (as well as other "reasonably foreseeable," authorized, or permitted actions).

- Inclusion of 1995 permitted wells in cumulative analysis. All compressor emissions permitted in 1995, plus all compressor and well emissions permitted between January 1996 through April 1998, were included in the cumulative air quality impact assessment. All wells permitted before January 1996 were assumed to be operating and reflected in the 1995 IMPROVE background visibility monitoring data. Although assuming emission sources permitted before January 1996 were represented in the 1995 monitoring data could potentially underestimate total cumulative impacts, it is more likely modeling 1995 permitted wells in addition to assuming their impacts are reflected in 1995 background monitoring data would unreasonably overestimate potential impacts through "double counting."

- Inclusion of secondary organic aerosol impacts in the visibility analysis. Based on a review of the current (but insufficient) documentation and research of potential visibility impacts in urban areas due to secondary organic aerosols, such as the Los Angeles, California, basin studies of Pandis et al. (1992) and Grosjean (1984, 1985), rural Wyoming and Colorado are not conducive to such photochemical reactions. At present, organic aerosol formation processes are not well-understood, and current modeling techniques are not available for estimating visibility degradation. A similar conclusion has been reached by the Southwest Wyoming Technical Air Forum.

Given the numerous "reasonable, but conservative" analysis assumptions which overestimate potential air quality impacts, the scientific evidence is not compelling that "reasonably foreseeable significant adverse" impacts would occur because some assumptions may potentially underestimate potential impacts.

It is important to note that before development could occur, the WDEQ-AQD would review specific air pollutant emissions preconstruction permits which examine potential project-wide air quality impacts above statutory minimum levels. As part of these permits (depending on source size), WDEQ-AQD could require additional air quality impacts analyses or mitigation measures. Thus, as development occurs, additional site-specific air quality analyses would be performed to ensure protection of air quality resources.

4.1.1.7 Incomplete and Unavailable Information

The BLM assessed potential air quality impacts from the Proposed Action in addition to the existing air quality (measured background) conditions. These total potential impacts were then compared to existing legal requirements and other scientifically defensible threshold levels in order to disclose potential significant adverse impacts to the public, governmental agencies, and the BLM decision-maker before a ROD is issued either denying, approving, or approving with stipulations any of the alternatives analyzed.

Given the speculative nature of the Proposed Action and alternatives, definitive information is not always available, and it is necessary to make "reasonable, but conservative" assumptions to assure any significant, adverse impacts would be disclosed. However, when several "reasonable, but conservative," assumptions are combined in the overall analysis, the resulting predicted impacts overestimate the actual conditions which would occur.

The inclusion of secondary organic aerosol impacts to visibility analysis was not considered to be "reasonable," and therefore was not included in the cumulative air quality impact assessment. Based on a review of the current (but insufficient) documentation and research of potential visibility impacts in urban areas due to secondary organic aerosols, such as the Los Angeles, California, basin studies of Pandis et al. (1992) and Grosjean (1984, 1985), rural Wyoming and Colorado are not conducive to such photochemical reactions. At present, organic aerosol formation processes are not well-understood, and current modeling techniques are not available for estimating visibility degradation. Although some organic carbon aerosols sampled at IMPROVE monitoring sites exhibit a connection to observed visibility measurements these organic carbon data are the most uncertain of the IMPROVE measurements, and do not identify specific organic compounds. The IMPROVE monitoring network is not designed to determine the source (natural or man-made) or chemical composition of the sampled compounds; therefore, the data necessary to evaluate potential rural visibility impacts from project-related VOC emissions (as opposed to the Los Angeles Basin) are not available. The methods needed to predict potential visibility impacts from secondary organic aerosols may become available in the future through ongoing visibility-related research. However, estimation of potential visibility impacts due to secondary organic aerosol formation is not currently supported by credible scientific evidence and, therefore was not included in this air quality impact assessment.

4.1.2 Topography and Physiography

The BLM GDRA and GRRA RMPs (BLM 1990a, 1997a) and state (WSLUC 1979) and local (THK 1977; UW 1991; and Pedersen Planning Consultants 1997, 1998) land use plans address the following management objectives associated with topography and physiography:

- to maintain and protect the beauty of natural vistas;
- to coordinate land use decisions with economic factors;
- to maintain or improve the quality of air, water, and land resources;
- to review all land exchanges;
- to provide for the disposition of solid waste to protect the environment from degradation and scenic resources from unsightly litter; and
- to establish a balance between resource conservation and economic development.

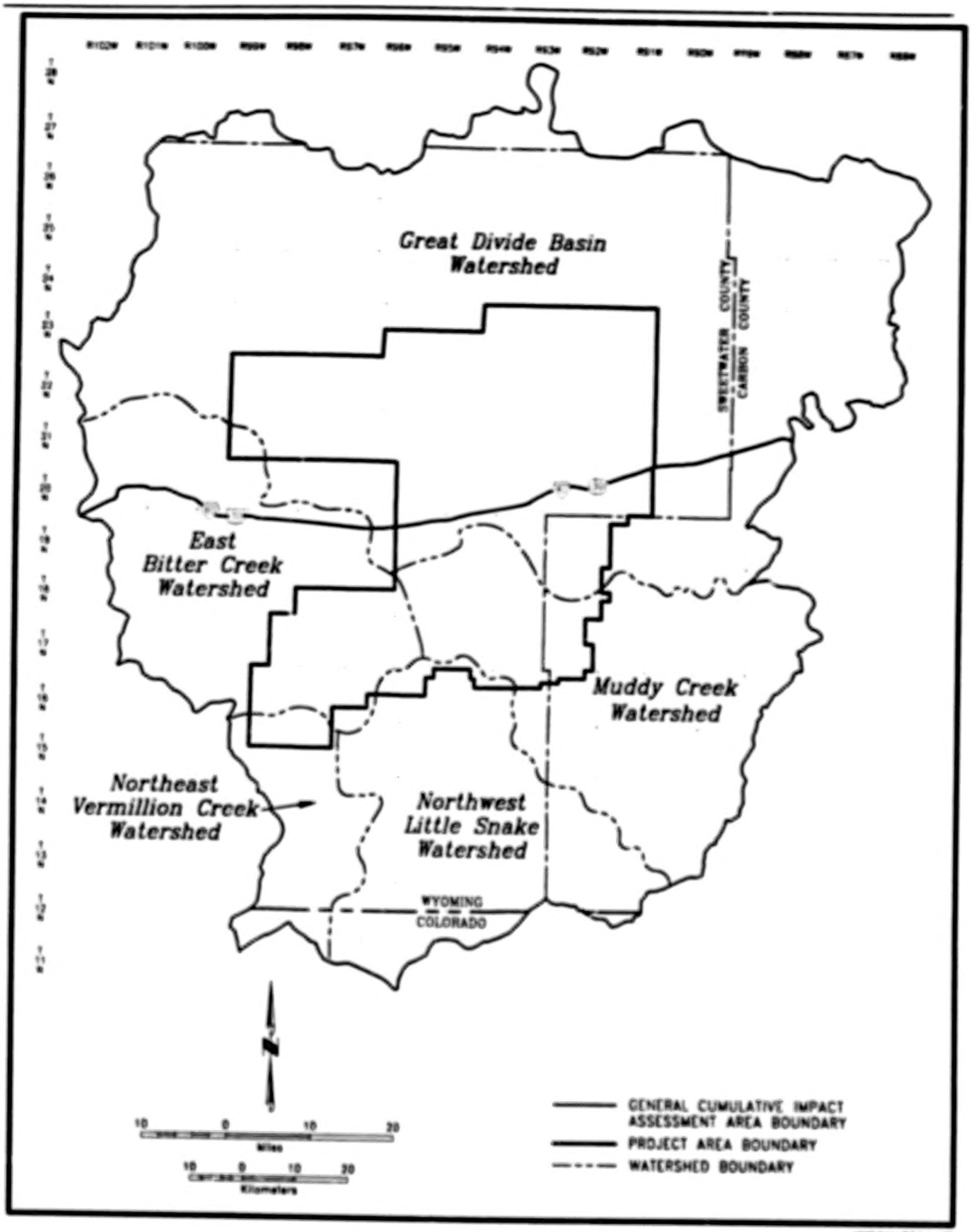
The following analysis shows that the Proposed Action and alternatives are compatible with these management objectives, and no significant impacts are anticipated.

4.1.2.1 Proposed Action

Impacts to topography and physiography resulting from the Proposed Action would be insignificant for the LOP and beyond, and because all facility sites would eventually be reclaimed, the only permanent impacts would be associated with roads designated to remain intact by the BLM after the project is completed. The primary impacts to topography and physiography would be changes to the landscape from cut-and-fill activities used to level well locations and to make roadbeds. Road and pipeline stream crossings also have the potential for impacting surface drainage.

The maximum new cut-and-fill disturbance required for the Proposed Action would total 22,400 acres initially and 8,300 acres for the LOP (2.1% and 0.8% of the CD/WIIPA, respectively) (see Table 2.1). Surface disturbance would occur within five watersheds (Map 4.2) and would be approximately distributed as illustrated in Table 4.7.

Proposed development activities would not require moving large amounts of earth, and no prominent landforms (e.g., Delaney Rim, the Haystacks) would be destroyed. Prominent landforms would be avoided, where possible. Roads would be constructed in adherence to the transportation planning guidelines for this project (see Appendix B) and would follow specifications presented in Section 9113, road standards manual (BLM 1985, 1991a), which requires restoration of surface drainage patterns with culverts, ditches, or other means during construction. Pipelines would be constructed using standard industry practices, which include provisions for drainage crossing and restoration.


R102W
R101W
R100W
Great Divide Basin Watershed
SWEETWATER COUNTY
CARBON COUNTY
East Bitter Creek Watershed
Muddy Creek Watershed
Northeast Vermillion Creek Watershed
Northwest Little Snake Watershed
WYOMING
COLORADO
N
10
0
10
20
Miles
10
0
10
20
Kilometers
GENERAL CUMULATIVE IMPACT ASSESSMENT AREA BOUNDARY
PROJECT AREA BOUNDARY
WATERSHED BOUNDARY

Map 4.2 Affected Watersheds Within the General Cumulative Impact Assessment Area, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Table 4.7 Acreage of Project-Required and Cumulative Surface Disturbance Within Affected Watersheds, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

	Project-Required[2]		Cumulative[3]		Total[5]	
Watershed[1]	Initial	LOP	Existing[4]	Reasonably Foreseeable	Acres	%
Great Divide Basin	12,400	4,600	39,200	5,200	49,000	1.1
East Bitter Creek	3,100	1,200	34,900	3,200	39,300	0.9
Muddy Creek	3,300	1,200	7,500	3,000	11,700	0.3
Northwest Little Snake	2,700	1,000	4,000	400	5,400	0.1
Northeast Vermillion Creek	900	300	500	100	900	<0.1
Total	22,400	8,300	86,100	11,900	106,300	<2.5

[1] See Map 4.2 for locations.
[2] Adapted from Table 2.1 for the CD/WIIPA.
[3] Analysis for entire GCIAA.
[4] Includes areas of existing long-term disturbance required for the proposed project (7,600 acres).
[5] Includes all existing, project-required (LOP), and reasonably foreseeable surface disturbance within the GCIAA.

4.1.2.2 Alternative A

No significant impacts to topography and physiography would occur under Alternative A. The level of impact would be similar to that of the Proposed Action but reduced on federal lands due to long-term surface disturbance limitation requirements specified for SRAs which occupy approximately 27% of the CD/WIIPA (286,500 acres) (see Map 2.3). Table 2.2 provides details on the surface disturbance limitations established for Alternative A.

4.1.2.3 Alternative B

No significant impacts to topography and physiography would occur under Alternative B. The level of impacts would be similar to that of the Proposed Action but reduced on federal lands due to long-term surface disturbance limitation requirements specified for SRAs. In general, surface disturbance and associated impacts under Alternative B would be intermediate between the Proposed Action and Alternative A (see Table 2.2).

4.1.2.4 No Action

No significant impacts to topography and physiography are anticipated under the No Action Alternative. However, impacts to topography and physiography under this alternative could be increased from those of the Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts (see Appendices A and B). Existing long-term disturbance in the CD/WIIPA totaling 14,800 acres (1.4% of the area) would continue for current CD/WIIPA land uses (see Table 4.2), and commensurate with existing oil and gas development policy, an estimated additional 6,400 acres of new disturbance and 2,400 acres of new long-term disturbance would likely result from future oil and gas exploration and development in the CD/WIIPA (see Table 2.1). Total surface disturbance in the CD/WIIPA under the No Action Alternative is estimated to be 24,800 acres (2.3% of the area) initially and 17,200 acres (1.6%) for the long-term (i.e., 30-50 years). In the absence of further development in the area, no impacts to topography and physiography would occur, and existing CD/WIIPA topographic and physiographic features would remain unchanged from those existing today.

4.1.2.5 Mitigation and Monitoring

Applicant-Committed Measures

- Operators would incorporate in their Surface Use Plans and Plans of Development the reclamation procedures and specifications contained in *Standard Practices Applied to Surface-Disturbing Activities* (BLM 1992: Appendix 7-2), the Reclamation Plan for this project (Appendix A), and guidelines for road construction contained in BLM Manual, Section 9113 (BLM 1985, 1991a), TP (Appendix B), and TPTSD (BLM 1999a).
- Areas with high erosion potential and/or rugged topography (i.e., steep slopes [>25%], stabilized sand dunes, floodplains, erosive and sandy soils) would be avoided where possible, or specialized mitigation measures to control erosion would be applied.
- Upon completion of construction and/or production activities, Operators would restore the topography to near pre-existing contours at well sites, access roads, pipelines, and other facility sites.

Additional Potential BLM-Required Measures

Operators may be required to site-specifically reduce the size of disturbance areas.

4.1.2.6 Cumulative Impacts

The cumulative impacts analysis areas for topography/physiography are the affected watersheds within the GCIAA (Table 4.1, Map 4.2). Maximum total existing, proposed, and reasonably foreseeable topographic alteration within the GCIAA includes approximately 106,300 acres of long-term direct surface disturbance, or 2.4% of the area (Table 4.2). The majority of this disturbance would occur within the Great Divide Basin watershed (49,000 acres of disturbance within the 2,476,023-acre watershed; 2.0% of the area). These disturbances include cut-and-fill areas associated with well locations, roads, and ancillary facility sites. Generally, past, present, and reasonably foreseeable actions require restoration of disturbed areas to predisturbance conditions. Some topographic alterations, such as disturbances from wellpads, may remain for several years. Others, such as the cuts and fills associated with existing major roads and highways, would be permanent. However, most changes affect a very small portion of the total land surface, and the relatively flat terrain in the area would make such changes insignificant in both the short-term and long-term.

Although there is widespread oil and gas development in the region, standard stipulations and project- and site-specific construction and reclamation procedures would be implemented, thereby precluding significant cumulative impacts to topography or physiography. Surface drainage patterns would be maintained, and reclamation procedures would include regrading and recontouring disturbed areas to approximate original conditions and re-establishing appropriate vegetative cover to stabilize reclaimed landscapes (see Appendix A).

4.1.3 Mineral Resources

The BLM GDRA and GRRA RMPs (BLM 1990a, 1997a) and state (WSLUC 1979) and local (THK 1977; UW 1991; and Pedersen Planning Consultants 1997, 1998) land use plans address the following management objectives associated with mineral resources:

- to provide opportunity for leasing, exploration, and development of oil and gas while protecting other resource values;
- to plan land use consistent with the orderly development, use, and conservation of renewable and nonrenewable natural resources;
- to plan land use that encourages the conservation of energy;
- to minimize conflicting demands on the use of natural resources;
- to promote restoration of mine areas to a condition that maximizes the continued use of the land for scenic, grazing, or other appropriate purposes;
- to achieve a balance between resource conservation and economic development;

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- to recommend that CD/WIIPA lands and other areas be used (but not exclusively) for oil and gas exploration, production, transportation, and processing; and
- to recommend and encourage the exploitation of mineral resources on agricultural land.

The following analysis shows that the Proposed Action and development alternatives are compatible with these management objectives and no significant adverse impacts are anticipated. However, under the No Action Alternative, if development is denied, significant adverse impacts could occur due to the violation of leaseholders rights.

4.1.3.1 Proposed Action

The depletion of recoverable gas and oil reserves from the Mesaverde Group and other formations underlying the CD/WIIPA would be significant. Under maximum development, an estimated 3 trillion cubic feet (tcf) of gas and 500 mbo (i.e., condensates) would be recovered from the CD/WIIPA, and these resources would not be available for future energy needs. While the impact would be significant, it would be economically beneficial to the general public, and no mitigation would be applied.

While oil and gas development in portions of the CD/WIIPA may preclude coal mining for the LOP and possibly beyond, there is no coal mining occurring in the CD/WIIPA and the potential for coal mining during the LOP is low. Therefore, the Proposed Action likely would have an insignificant impact on coal recovery, even though the CD/WIIPA is located within the Red Desert and Little Snake River Valley Known Recoverable Coal Reserve Areas and there is some potential for future coal mining (BLM 1987a). Additionally, coal mining within the CD/WIIPA may already be precluded by existing oil and gas developments. No impacts are anticipated for potential coalbed methane development because no projects are currently proposed in the area.

Sporadic mining operations in the CD/WIIPA include sand and gravel quarries. Materials from these quarries would likely be used for development and maintenance of CD/WIIPA roads. No detrimental impacts to existing operations are anticipated from the Proposed Action. Additional gravel sources outside of the CD/WIIPA also likely would be used to acquire road-surfacing materials, and additional sources within the CD/WIIPA would be identified (BLM 1999b). While there is potential to mine uranium in the CD/WIIPA, no development is expected in the near future. The potential for other mineral development activities is low. Impacts from the Proposed Action on other mineral resources are anticipated to be insignificant.

4.1.3.2 Alternative A

Since gas and oil recovery on the CD/WIIPA would continue until recovery becomes uneconomical, impacts to gas and oil resources under Alternative A would be the same as the Proposed Action (i.e., significant and beneficial). Impacts to coal and other mineral developments under Alternative A would also be the same as that of the Proposed Action (i.e., insignificant); however, there may be some reduction in the potential for future conflicts between gas and oil recovery and coal mining or other mineral recovery operations due to reduced surface disturbances in SRAs.

4.1.3.3 Alternative B

Since gas and oil recovery on the CD/WIIPA would continue until recovery becomes uneconomical, impacts to gas and oil resources from Alternative B would be the same as the Proposed Action and Alternative A (i.e., significant and beneficial). Impacts to coal and other mineral developments under Alternative B would also be the same as that of the Proposed Action (i.e., insignificant); however, there may be some reduction in the potential for future conflicts between gas and oil recovery and coal mining or other mineral recovery operations due to reduced surface disturbances in SRAs.

4.1.3.4 No Action

Impacts to existing gas and oil resources under the No Action Alternative would not be significant; however, rights to develop the gas on the CD/WIIPA as provided in existing leases may be infringed, which would be a significant adverse impact and violate contractual agreements between the government and the leaseholders. Under the No Action Alternative, some of the oil and gas resources on the CD/WIIPA could remain available for future recovery; however, since the demand for energy is constantly growing, reduced development in the CD/WIIPA would likely lead to development of alternative oil and gas recovery proposals to meet increasing energy needs.

Under the No Action Alternative, there would be insignificant impacts to coal mining or other mineral resource developments.

4.1.3.5 Mitigation and Monitoring

Applicant-Committed Measures

BLM/WOGCC casing and cementing criteria would be followed to protect all subsurface mineral- and water-bearing zones.

Additional Potential BLM-Required Mitigation

The loss of access to potential mineral resources may be mitigated by avoiding areas of known accessible reserves. If coal or uranium mining on the CD/WIIPA becomes economical in the future, additional mitigations may be developed by the BLM.

4.1.3.6 Cumulative Impacts

The cumulative impacts analysis for mineral resources identified all existing, proposed, and foreseeable future mineral development activities in the MCIAA (see Map 4.1 and Table 4.2). Existing oil and gas operations within this area have resulted in the direct surface disturbance of 30,800 acres in nine oil and gas project areas. Total existing, proposed, and reasonably foreseeable oil and gas wells and associated direct surface disturbance within the MCIAA in combination with disturbances from other mineral developments would be 70,800 acres (3.4% of the MCIAA), and it is assumed that with this level of development all oil and gas and coal resources would be adequately recovered from their respective project areas. The direct short-term and long-term impacts to mineral resources would be considered significantly beneficial, as the recovery of these resources would benefit society. However, permanent impacts would be considered significantly adverse as these resources would not then be available for future use.

Cumulative impacts to the development of coal resources resulting from gas and oil developments would result from the preclusion of coal mining from newly developed gas and oil fields, as well as the incremental increase in the length of time coal mining is excluded from new gas and oil development project areas. Although coal mining is not anticipated in the near future, it may become economical prior to the cessation of gas and oil production operations in the region, at which point resource development conflicts could occur. When coal mining would become economical is not known, and thus, the magnitude of this potential impact cannot be evaluated. Since oil and gas developers in the area have leases in place, they have priority and would be allowed to continue to recover reserves under their current leases.

Cumulative beneficial impacts to the development of other mineral resources in south-central Wyoming could occur as a result of improvements to local transportation networks and increased local demands (e.g., road-surfacing materials). Road construction and the existence of ancillary facilities (e.g., pipelines) may facilitate exploration for and recovery of other minerals. However, because the area is relatively remote, many of these resources would probably be of local importance only (BLM 1987a).

4.1.4 Geologic Hazards

The BLM GDRA and GRRA RMPs (BLM 1990a, 1997a) and state (WSLUC 1979) and local (THK 1977; UW 1991; and Pedersen Planning Consultants 1997, 1998) land use plans prescribe the following management objectives associated with geologic hazards:

- to protect public environmental health and safety on BLM-administered lands; and
- to promote a pattern of development that takes into consideration the natural constraints to development in order to ensure a minimum loss of life and property from natural hazards.

The following analysis shows that the Proposed Action and alternatives are generally compatible with these management objectives; however, significant impacts could result under the Proposed Action and No Action Alternative if stabilized dunes are reactivated.

4.1.4.1 Proposed Action

Potential impacts to the project from geologic hazards would be insignificant for the LOP and beyond. The depth of gas reserves negates the potential for subsidence, and there are no known underground mines in the CD/WIIPA. Areas prone to landslides or flooding would be avoided, wherever possible; therefore, impacts to and from these hazards would not be significant. Earthquake potential is low to moderate, and thus, impacts from earthquakes are not anticipated to be significant. Wells and pipelines would be designed and constructed such that moderate earthquakes (intensity 6 to 8 on the modified Mercalli Scale) would not damage facilities.

Removal of ground cover could result in the reactivation of stabilized sand dunes which could cause significant soil loss and a decrease in vegetation productivity if these areas are not adequately reclaimed. Stabilized dunes would be avoided, where possible, and all necessary disturbances of dunes would be reclaimed and stabilized as soon as practical based on consultations with the BLM conducted during APD and ROW application processes and in adherence with the reclamation guidelines presented in Appendix A.

There is an unknown potential for the mobilization of radioactive materials in drill cuttings. However, since cuttings would be held in the reserve pit and disposed of as directed by the BLM or WOGCC, no significant adverse impacts are anticipated.

4.1.4.2 Alternative A

Impacts from and to most geologic hazards under Alternative A would approximate those for the Proposed Action. However, since long-term surface disturbance limitations would be applied in SRAs under Alternative A (14-acre maximum per federal section, see Table 2.2), there would be a reduced potential for the reactivation of sand dunes from that of the Proposed Action. Dunal areas are included in SRAs (see Maps 2.3 and 3.3). Under Alternative A, impacts to stabilized dunes are anticipated to be insignificant. Some increase in disturbance of dunal areas on non-BLM lands would likely occur under Alternative A.

4.1.4.3 Alternative B

Impacts from and to most geologic hazards under Alternative B approximate those for the Proposed Action and Alternative A. However, since long-term surface disturbance limitations would be applied in SRAs under Alternative B (30-acre maximum per federal section, see Table 2.2), there would be a reduced potential for the reactivation of sand dunes from that of the Proposed Action, but an increased potential from that of Alternative A. Impacts to stabilized dunes are anticipated to be insignificant under Alternative B. Some increase in disturbance of dunal areas on non-BLM lands would likely occur under Alternative B.

4.1.4.4 No Action

Under the No Action Alternative, impacts to and from geologic hazards would occur at levels consistent with those presently occurring in the area, and no significant impacts are anticipated. However, if portions of the estimated 6,400 acres of new disturbance and 2,400 acres of new long-term disturbance occurs on stabilized dunes, and these dunes are inadequately reclaimed and are reactivated, significant adverse impacts would occur. Further, impacts to and from geologic hazards could be augmented from those of the Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts (see Appendices A and B). In the absence of further development in the area, no impacts to or from geologic hazards would occur.

4.1.4.5 Mitigation and Monitoring

Applicant-Committed Measures

Geologic risks would be minimized by implementing site-specific alignment variations for roads, pipelines, and drill pads to avoid and/or minimize disturbances to unstable areas.

Additional Potential BLM-Required Mitigation

The BLM may require that wells, pipelines, and ancillary facilities be designed and constructed such that moderate earthquakes would not damage these features. In addition, activities within potential landslide areas or on slopes greater than 25% may be restricted. Unavoidable disturbance of these areas would be reviewed on a site-specific basis by the BLM during the APD and/or ROW application processes.

To mitigate potential impacts caused by flooding during the LOP, construction in flood-prone areas may be limited to late summer, fall, or winter when conditions are generally dry and streamflows are low. Additional mitigation to lessen any impacts from flooding or high flows during and after construction may include the avoidance of areas with high erosion potential (i.e., steep slopes, floodplains, unstable soils), re-establishment of existing contours, avoidance of areas within 500 ft of open water and 100 ft of ephemeral/intermittent drainage channels, and implementation of appropriate erosion and sediment control and revegetation procedures as identified in site-specific reclamation plans.

To prevent reactivation of vegetation-stabilized sand dunes, development in these areas may be restricted, and areas necessarily disturbed may require alternative reclamation practices (see Appendix A). If deemed appropriate by the BLM, disturbed areas may be mulched or otherwise protected to prevent wind erosion and facilitate plant establishment.

The BLM may require modified monitoring, containment, and disposal of drill cuttings in certain areas if radioactive cuttings are encountered.

4.1.4.6 Cumulative Impacts

The cumulative impacts analysis area for geologic hazards is the CD/WIIPA (see Table 4.1). Impacts to or from geologic hazards are insignificant at the present time, and with implementation of proposed mitigation measures (see Section 4.1.4.5 and Appendix A), impacts would be consistent with those described for the various alternatives listed above since no other developments for the CD/WIIPA are anticipated.

4.1.5 Paleontological Resources

The BLM GDRA and GRRA RMPs (BLM 1990a, 1997a) and state (WSLUC 1979) and local (THK 1977; UW 1991; and Pedersen Planning Consultants 1997, 1998) land use plans address the following management objectives associated with paleontological resources:

- to expand the opportunities for scientific studies and educational and interpretive uses of paleontological resources; and
- to resolve conflicts between paleontological resources and other resource uses.

The following analysis shows that the Proposed Action and alternatives are compatible with these management objectives and no significant impacts are anticipated.

4.1.5.1 Proposed Action

Both direct and indirect impacts to important paleontological resources from the Proposed Action are not anticipated to be significant. The potential for significant paleontological locations at construction sites would be assessed during preconstruction by BLM personnel, and site reconnaissance, including construction monitoring, would be conducted as necessary by a qualified paleontologist. Significant paleontological locations would be avoided or mitigated.

The Proposed Action would initially require approximately 14,600 acres (i.e., 65% of all newly proposed disturbance [22,400 acres], see Table 2.1) of surface area underlain by the Washakie, Green River, Wasatch, Fort Union, and Battle Spring Formations, which all have a high potential for paleontological locations. This disturbance has the potential to result in the discovery of currently unknown paleontological resources, as well as the potential to destroy paleontological resources if their presence is undetected prior to disturbance. Indirect impacts to paleontological resources could occur from the loss of important fossil materials due to private collection or vandalism of newly exposed areas. Beneficial impacts could result from the discovery and analysis of paleontological resources uncovered during project implementation.

4.1.5.2 Alternative A

With the application of mitigation measures (see Section 4.1.5.5), paleontological impacts resulting from Alternative A would remain insignificant. Additionally, indirect impacts, as well as the potential for beneficial impacts, may be reduced from those of the Proposed Action on federal lands in SRAs due to surface disturbance limitations (14-acre maximum per federal section, see Table 2.2).

4.1.5.3 Alternative B

With the application of mitigation measures (see Section 4.1.5.5), paleontological impacts resulting from

Alternative B would remain insignificant. Additionally, indirect impacts, as well as the potential for beneficial impacts, may be reduced from those of the Proposed Action, but increased from those of Alternative A on federal lands in SRAs due to surface disturbance limitations (30-acre maximum per federal section, see Table 2.2).

4.1.5.4 No Action

Under the No Action Alternative, impacts to paleontological resources would occur at levels consistent with those occurring today. However, some potential for new paleontological discoveries would be foregone. Commensurate with existing oil and gas development policy, an estimated additional 6,400 acres of new disturbance and 2,400 acres of new long-term disturbance likely would result from future oil and gas exploration and development in the area. In the absence of further development in the CD/WIIPA, existing paleontological resources would remain unchanged.

4.1.5.5 Mitigation and Monitoring

Applicant-Committed Measures

If paleontological resources are discovered by the Operators or any person working on their behalf, at any time during construction, construction activities that could potentially disturb these resources would cease and the BLM would be notified immediately. In compliance with paleontological resource management guidelines (BLM 1998b, 1998c), the BLM would arrange for a determination of significance and, if necessary, recommend a recovery or avoidance plan. Mitigation of paleontological resources would be on a case-by-case basis, and the Operator would incur all costs. Surface-disturbing activity would not resume until a Notice to Proceed is issued by the BLM.

Additional Potential BLM-Required Mitigation

- The BLM would protect and mitigate paleontological resources in compliance with management guidelines (BLM 1998b, 1998c). The potential paleontological value of construction sites may be assessed by BLM personnel during preconstruction, and the BLM may require a thorough survey of the CD/WIIPA prior to disturbance to identify the potential significance of vertebrate paleontology in the Tertiary outcrops that occur throughout the area. Paleontological surveys of disturbance areas may be conducted as determined by the BLM to ensure that significant paleontological resources are avoided or recovered prior to construction. Operators may be required to finance a paleontological field survey of proposed disturbance areas which have been determined by the BLM to potentially contain significant paleontological resources (fossils). If monitoring during construction is deemed necessary by the BLM, a BLM-qualified paleontologist may be required to be on-site during construction activities to mitigate direct and indirect impacts to significant paleontological resources. Paleontological surveys, data recovery, and monitoring would be required in accordance with BLM Manual 8270 guidelines (BLM 1998b, 1998c).

In addition to the predisturbance survey conducted as deemed appropriate by the BLM, specific unavoidable high-value sites could require monitoring as necessary by a qualified paleontologist during construction. If significant paleontological materials are found during construction, all activities at the site would cease immediately, and the Authorized Officer would be notified immediately by the Operators or their subcontractor to assure proper handling of the discovery by a qualified paleontologist.

The BLM may require Operators to inform their employees and contractors regarding the potential of encountering fossils and the steps to take if fossils are discovered during project activities. The illegality of removing fossil materials from federal lands without an appropriate permit also could be explained.

4.1.5.6 Cumulative Impacts

The cumulative impacts analysis area for paleontological resources is the CD/WIIPA. With implementation of mitigation and monitoring practices as discussed for the Proposed Action and alternatives (see Section 4.1.5.5), impacts to paleontological resources would remain insignificant.

4.1.6 Soils

The BLM GDRA and GRRA RMPs (BLM 1990a, BLM 1997a) and Standards for Healthy Rangelands (BLM 1997b) and state (WSLUC 1979) and local

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(THK 1977; UW 1991; and Pedersen Planning Consultants 1997, 1998) land use plans address the following management objectives associated with soils:

- to stabilize and conserve soils;
- to protect the land from soil erosion;
- to control flood and sediment damage from natural or human-induced causes;
- to maintain soil cover and productivity where they are adequate;
- to increase soil cover and vegetation productivity where they are in a downward trend;
- to improve forage production and ecological conditions for the benefit of livestock use, wildlife habitat, watershed, and riparian habitat;
- to restore, maintain, or improve riparian habitat to enhance forage conditions, wildlife habitat, and stream quality;
- to achieve proper functioning condition or better on riparian areas;
- to protect, maintain, or improve wetlands, floodplains, and riparian areas;
- to ensure that riparian and wetland vegetation is capable of recovering from natural and human disturbance in order to provide for sediment capture; and
- to ensure that soils are stable and allow for water infiltration to provide for optimal plant growth and minimal surface runoff.

The following analysis shows that the Proposed Action and alternatives are generally compatible with these management objectives; however, significant impacts could result if stabilized sand dunes are reactivated.

4.1.6.1 Proposed Action

Impacts to soils from the Proposed Action may be significant due to the potential for the reactivation of stabilized sand dunes (1,300 acres of initial surface disturbance and 660 acres of long-term surface disturbance in dunal/sandy soil areas) (Table 4.8). However, with the exception of roads designated by the BLM to be retained for other land uses, all disturbed areas would be reclaimed following project completion (see Appendix A). Total initial and LOP disturbance in the CD/WIIPA, including existing disturbance required for the Proposed Action, would be 33,600 and 15,900 acres, respectively.

While sensitive soils would be avoided where possible during project construction, some sandy soils and erosive soils would likely be disturbed. Sandy and erosive soils are difficult to reclaim, and special attention would be given to potential soil disturbance and reclamation problems (e.g., erosion, revegetation; see Appendix A). Since total initial and LOP disturbance in areas with erosive soils would be less than 350 acres and less than 190 acres, respectively, impacts to erosive soils are anticipated to be insignificant.

Most soils in the CD/WIIPA are highly erodible, and the amount of soil lost under natural conditions has not been quantified. However, the widespread potential for wind and water erosion on CD/WIIPA soils indicates that soil losses would increase as a result of the Proposed Action. The amount of this additional soil loss depends upon site-specific conditions and the effectiveness of proposed mitigation measures (see Appendix A). Further, linear features such as roads and pipelines likely would have augmented soil impacts due to the large amount of edge between affected (disturbed) and unaffected areas, and roads on private lands that are not built in accordance with BLM guidelines could have increased impacts (road failures, increased runoff). Approximately 70% of the disturbance required for the LOP would be linear (11,200 acres), and approximately 50% of this disturbance (35% of all disturbance, 5,600 acres for the LOP) would be on private lands.

It is anticipated that most construction-phase and LOP soil impacts would be insignificant and would occur during vegetation stripping, topsoil salvage and stockpiling, and cut-and-fill operations, due to increased soil exposure. Exposed or stockpiled soils would be subject to accelerated erosion due to higher runoff rates, lower infiltration rates, and greater exposure to wind, unless erosion control measures are implemented. Soil compaction, caused by equipment traffic or raindrop impact, may result in reduced soil productivity due to loss of soil structure, increased erodability, and decreased infiltration and water storage capacity. Crusts formed on exposed soils also could inhibit infiltration and productivity.

Soils could be contaminated by accidental spills of petroleum products or other hazardous materials (see Section 4.7).

Table 4.8 Soil Disturbance, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Type	Total Acreage	Total Acreage Disturbed[1] Initial	Total Acreage Disturbed[1] LOP
Sandy soils	90,000	1,300	660
Erosive soils	<18,800	<350	<190
Other	>952,400	>31,950	>15,050
Total	1,061,200	33,600	15,900

[1] Adapted from Table 2.1 and includes areas of existing disturbance required for the proposed project.

Some soils in the CD/WIIPA may contain selenium or other potentially toxic elements, and disturbance of these soils may result in increased mobilization of these elements through plant uptake and erosion. While the total increase in the mobilization of potentially toxic elements resulting from the Proposed Action are unknown, they are expected to be insignificant due to the application of appropriate erosion control, soil stabilization, and reclamation measures.

4.1.6.2 Alternative A

Impacts to soils under Alternative A are anticipated to be reduced from those of the Proposed Action and would be insignificant during construction and for the LOP due to surface-disturbance limitations in areas with stabilized sand dunes (14-acre maximum surface disturbance per section on federal lands in SRAs) (see Table 2.2). While the total area of soils disturbed may be the same as that of the Proposed Action, disturbed areas would be reclaimed such that in no instance would the total area disturbed exceed 14 acres per section (640 acres) at any one time on federal lands. Some increase in surface disturbance may occur on private lands under this alternative.

4.1.6.3 Alternative B

Impacts to soils under Alternative B would be reduced from those of the Proposed Action during construction and for the LOP due to surface disturbance limitations in areas with stabilized sand dunes (30-acre maximum surface disturbance per section of federal lands in SRAs) (see Table 2.2). While the total area of soils disturbed may be the same as that of the Proposed Action, disturbed areas would be reclaimed such that in no instance would the total area disturbed exceed 30 acres per section (640 acres) at any one time on federal lands. Some increase in surface disturbance may occur on private lands under this alternative. Impacts to soils under Alternative B are anticipated to be greater than those occurring under Alternative A, but less than those occurring under the Proposed Action.

4.1.6.4 No Action

Under the No Action Alternative, impacts to soils would occur at existing allowable levels, and no significant impacts are anticipated. However, approximately 320 acres of long-term disturbance could occur in dunal/sandy soil areas and less than 95 acres of long-term disturbance could occur in areas with erosive soils. If stabilized dunes are reactivated, significant adverse impacts could result. Furthermore, impacts could be increased from those of the Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts (see Appendices A and B). In the absence of further development in the CD/WIIPA, no additional impacts to soils would occur.

4.1.6.5 Mitigation and Monitoring

Applicant-Committed Measures

- Prior to commencement of well location construction, all available topsoil (up to 12 inches) would be stripped from cut, fill, stockpile, and pit areas, and salvaged topsoil would be stockpiled for future reclamation operations.
- Operators would keep the area of disturbance to the minimum necessary for drilling activities and subsequent production activities while providing for safety.
- Operators would restrict off-road vehicle activity by employees and contract workers.
- Operators would restrict project-related travel during periods when soils are saturated and excessive rutting (e.g., >4 inches) could occur.
- Where feasible, Operators would locate pipelines immediately adjacent to roads or other pipelines to avoid creating separate areas of disturbance.
- Operators would minimize construction activities in areas of steep slopes (e.g., >25%) and sand dunes and would apply special slope-stabilizing structures and techniques in accordance with applicable geotechnical data (e.g., mulch, revegetation) if construction cannot be avoided in these areas.
- Operators would not conduct construction activities using frozen or saturated soils, unless an adequate plan is submitted and approved by the BLM that demonstrates potential impacts would be mitigated.
- Operators would minimize disturbance to vegetated cuts and fills on new and existing roads.
- Runoff and erosion control measures such as water bars, berms, and interceptor ditches would be installed as necessary (see Appendix A).
- All drainage crossing structures would be designed to carry at least a 10-year/24-hr storm event, pursuant to guidelines in BLM Manual, Section 9113 (BLM 1985, 1991a).
- Operators would replace topsoil or suitable growth materials over all disturbed surfaces prior to revegetation.
- Operators would revegetate all disturbed sites as soon as practical following disturbance (see Appendix A).

Additional Potential BLM-Required Mitigation

Adverse impacts to soils may be further mitigated by further minimizing surface disturbance; avoiding areas with high erosion potential (e.g., unstable soils, dunal areas, slopes greater than 25%, floodplains); salvaging and selectively handling topsoil from disturbed areas; adequately protecting stockpiled topsoil using temporary vegetation cover or other appropriate means and replacing it on the surface during reclamation; leaving the soil intact (scalping only) during pipeline construction; using alternative erosion and sedimentation control techniques including, but not limited to, diversion terraces, riprap, and matting; and promptly revegetating disturbed areas using adapted species. At locations with high erosion potential, where soils must be disturbed and hence the potential for soil loss is increased, more rigorous erosion control measures may be applied. For example, temporary erosion control measures such as temporary vegetation cover; application of mulch, netting, or soil stabilizers; and/or construction of barriers may be used in these areas to minimize wind and water erosion and sedimentation prior to vegetation establishment. Erosion control efforts may require regular monitoring, if necessary, until erosion is minimized. Specific measures and locations would be specified in APDs and/or ROW applications and follow procedures presented in Appendix A.

Pipeline ROWs may be required to be located immediately adjacent to and partially within road ROWs to avoid creating separate areas of disturbance and to reduce the overall disturbance area. Disturbance to revegetated cuts and fills along existing roads would be minimized.

Additional erosion control and revegetation measures may be employed. Grading and landscaping may be used to minimize slopes, and water bars may be installed on disturbed slopes with grades of 6% or greater and may be installed on disturbed slopes with grades of less than 6% in areas with unstable soils where seeding alone would not adequately control erosion. Erosion control efforts may be monitored by the BLM and area Operators and augmented as necessary to control erosion.

Sufficient topsoil or other suitable material to facilitate revegetation may be required to be segregated from subsoils during all construction operations requiring excavation, and topsoil may be required to be returned to the surface upon completion of operations. Topsoil stockpiles may be revegetated or otherwise protected to prevent erosion and to maintain some soil microflora and microfauna. Soils compacted during construction may require ripping and tilling prior to topsoil respreading and/or reseeding. Cut-and-fill sections on all roads and along pipelines would be revegetated with indigenous or BLM-approved adapted species.

Operators could be required to conduct regular monitoring of erosion control structures within the CD/WIIPA to ensure maintenance of the operating integrity of these structures. Monitoring procedures and schedules would be specified in APDs or ROW applications and would comply with specifications contained in Appendix A. Appropriate remedial action would be taken by Operators to correct nonfunctioning structures.

4.1.6.6 Cumulative Impacts

The cumulative impacts analysis areas for soils are the affected watersheds within the GCIAA. Approximately 86,100 acres of soils have been disturbed in the GCIAA, primarily by roads, and the majority of this disturbance has occurred in the Great Divide Basin (39,200 acres) and East Bitter Creek (34,900 acres) watersheds (Map 4.2, Table 4.7). Significant long-term cumulative impacts could occur if new disturbance results in the reactivation of stabilized sand dunes; however, as with the Proposed Action, most disturbances would be reclaimed in adherence with procedures similar to those found in the Reclamation Plan for this project (see Appendix A). An adverse permanent indirect impact to soils would occur from continued road use and maintenance, and the potential failure of roads on private lands that are not constructed in adherence with authorized BLM road construction and maintenance procedures as referenced in the TP for this project (see Appendix B).

4.1.7 Surface and Ground Water

The BLM GDRA and GRRA RMPs (BLM 1990a, 1997a) and Standards for Healthy Rangelands (BLM 1997b) and state (WSLUC 1979) and local (THK 1977; UW 1991; and Pedersen Planning Consultants 1997, 1998) land use plans address the following management objectives associated with surface and ground water:

- to ensure water quality meets state standards;
- to protect surface and ground water resources from degradation;
- to meet or exceed established standards for quality of surface and ground water where water quality has been lowered by human-induced causes;
- to provide for physical and legal availability of water for use by the public and by federal, state, and local agencies for fisheries and wildlife and for livestock, recreational, municipal, and industrial uses;
- to reduce salt loading in watersheds that lie within the Colorado Basin;
- to conserve water and relate water resources and development to desired land use;
- to conserve surface water quality of local streams;
- to improve forage production and ecological conditions for the benefit of livestock use, wildlife habitat, watershed, and riparian habitat;
- to restore, maintain, or improve riparian habitat to enhance forage conditions, wildlife habitat, and stream quality;
- to achieve proper functioning condition or better on riparian areas;
- to maintain or improve surface and ground water quality;
- to protect, maintain, or improve wetlands, floodplains, and riparian areas;
- to ensure that riparian and wetland vegetation is resilient and capable of recovering from natural and human disturbance in order to provide for sediment capture, energy dissipation, and ground water recharge; and
- to ensure that soils are stable and allow for water infiltration to provide for optimal plant growth and minimal surface runoff.

The following analysis shows that the Proposed Action and alternatives are generally compatible with these management objectives; however, significant impacts could occur due to increased sedimentation, salinity, and loss of PFC or worsened conditions in FAR drainages.

4.1.7.1 Proposed Action

Potential impacts to surface water quality and quantity from the Proposed Action are anticipated for the LOP and beyond and include increased turbidity, salinity, and sedimentation of surface waters due to runoff and erosion from disturbed areas. Accidental spills of petroleum products or other pollutants and/or release of unsuitable quality produced water also could impact surface water quality (see Section 4.7).

Increased disturbance (most notably from roads) and associated potential increases in sedimentation and salinity could result in the loss of PFC within some drainages in the CD/WIIPA. Further, conditions could worsen along drainages that are currently classified as FAR (i.e., Antelope/Bitter Creek). While increased sedimentation and salinity volumes are unknown, potential significant impacts could occur if increases result in the loss of PFC or worsened conditions along FAR-classified drainages on or adjacent to the CD/WIIPA.

No surface water depletions in the Colorado River System would occur due to ground water use in the Great Divide Basin portion of the CD/WIIPA (an estimated 3,889 acre-ft), because the basin is closed. Since water well locations in the Washakie Basin have not been selected, it is not possible to definitively conclude that surface water depletion would not occur. The potential for depletions would depend on: 1) the vertical and horizontal proximity of water wells to streams or surficial aquifers and 2) the nature of the rock strata between water-producing formations and surface water resources. Surficial aquifers in the area (Quaternary alluvial and aeolian deposits), which typically are hydrologically connected to surface waters, are an estimated 0-70 ft thick, so water wells would be tapping deeper sources. Throughout the basin, subsurface ground water aquifers consist of complex layers of sandstone, conglomerate, siltstone, shale, and other strata that have very good to very poor hydraulic conductivity (Collentine et al. 1981; Welder and McGreavey 1966). Rocks with poor hydraulic conductivity act as aquitards that prevent water flow. Since the stratigraphy beneath the CD/WIIPA within the Washakie Basin contains many aquitards, the 400- to 1,000-ft deep water wells would likely be drilled in aquifers located below one or more aquitards and thus would not be connected with surface waters. Furthermore, ground water flow in the basin is towards deep sediments in the basin center, so deep wells would likely be tapping ground water that is downgradient from surface discharge points.

Over the 20-year project development period, an estimated 3,183 acre-ft of ground water would be required from Washakie Basin aquifers--approximately 159 acre-ft per year. A very small proportion, if any, of this annual usage would deplete surface waters. The greatest potential for depletions would occur for wells drilled in the Laney Member of the Green River Formation near Antelope Creek and wells drilled in the Wasatch Formation near Muddy Creek. However, even wells drilled in close proximity to these creeks are not likely to cause depletions because, on the vertical scale, they would not be completed near surface water sources. Thus, there is little to no potential for the project to cause surface water depletion, and there is no potential for depletions of more than 100 acre-ft per year.

Impacts to ground water from the Proposed Action are anticipated to be insignificant and would include the consumption of water used during drilling and completion. An estimated maximum of 7,072 acre-ft (2,304 million gallons) of water would be needed for drilling, completion, and testing operations over the LOP. Water would be provided from existing and newly drilled water wells located at natural gas locations throughout the CD/WIIPA. Fifty new water wells would be drilled to provide water for drilling and would be completed at depths ranging from 400 to 1,000 ft primarily in the Wasatch and Lance Formations. The use of water from these formations is not anticipated to impact existing and/or potential future water users.

Water and muds used for drilling would be stored in reserve pits at each well location, and while the majority of pits would be lined, some pits in areas with relatively impermeable soils (i.e., clay) would be unlined; therefore, some potential for contamination of surficial aquifers from drilling fluids exists. However, the potential for aquifer contamination from surface infiltration from reserve pits would be held to

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insignificant levels by lining pits in areas where soils are incapable of containing fluids or where ground water occurs within 20 ft of the surface.

An average of approximately 6 barrels per day (bpd) of water would be produced from each completed gas well, stored in tanks at each well location, and transported from tanks to lined evaporation pits or injection wells for disposal. With the application of applicant-committed mitigation measures, no adverse impacts to ground water resources from produced water disposal are anticipated (see Section 4.1.7.5).

Potential impacts to deeper aquifers include cross-aquifer mixing through the wellbore. However, the potential for these impacts is insignificant since all wells on federal land would be cased and cemented to depths below accessible freshwater zones pursuant to BLM Onshore Oil and Gas Order No. 2. All wells also would be constructed according to relevant WOGCC, BLM, and WDEQ regulations to prevent cross-aquifer contamination.
With the implementation of mitigation measures, most surface and ground water impacts resulting from the Proposed Action are anticipated to be insignificant and no long-term impacts to surface or ground water are anticipated.

4.1.7.2 Alternative A

Potential impacts to surface and ground water quality and quantity under Alternative A likely would occur at the levels identified for the Proposed Action.

4.1.7.3 Alternative B

Potential impacts to surface and ground water quality and quantity under Alternative B likely would occur at the levels identified for the Proposed Action.

4.1.7.4 No Action

Under the No Action Alternative, impacts to surface and ground water would continue at presently authorized levels, and no significant impacts are anticipated. However, impacts to water resources under this alternative could be increased from those of the Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts (see Appendices A and B). Existing long-term disturbance in the CD/WIIPA totaling 14,800 acres (1.4% of the area) would continue for current CD/WIIPA land uses (see Table 4.2), and commensurate with existing oil and gas development policy, an estimated additional 6,400 acres of new disturbance and 2,400 acres of new long-term disturbance would likely result from future oil and gas exploration and development in the CD/WIIPA (see Table 2.1). Total surface disturbance in the CD/WIIPA under the No Action Alternative is estimated to be 24,800 acres (2.3% of the area) initially and 17,200 acres (1.6%) for the long-term (i.e., 30-50 years). In the absence of further development in the CD/WIIPA, surface and ground water resources would remain unchanged from those existing today.

4.1.7.5 Mitigation and Monitoring

Applicant-Committed Measures

- Construction at drainage crossings would be limited to periods of low or no flow.
- Operators would follow all practical alternatives and designs to limit disturbance within drainage channels, including ephemeral and intermittent draws.
- Channel crossings by pipelines would be constructed so that the pipe is buried at least 4 ft below the channel bottom.
- Channel crossings by roads and pipelines would be constructed perpendicular to flow.
- Disturbed channel beds would be reshaped to their approximate original configuration.
- All disturbances to wetlands and/or waters of the U.S. would be coordinated with the COE, and Section 404 permits would be secured as necessary prior to disturbance.
- A 500-ft wide buffer area of undisturbed land would be left between construction sites and perennial channels or open water areas.
- A 100-ft wide buffer area of undisturbed land would be left between construction sites and ephemeral and intermittent channels.
- All reserve pits would be constructed in cut or stabilized fill material.
- Subsurface material at all reserve pits would be inspected by BLM as deemed necessary during construction to assess stability and permeability to determine the need for pit

reinforcement or lining. If directed by the BLM and/or the WOGCC, a synthetic liner would be installed.

- Reserve pits that contain materials potentially hazardous to the environment (see Appendix C and BLM [1998b]) would be lined if they are located at sites where ground water occurs within 20 ft of the surface or where potential ground or surface water could be contaminated.
- If reserve pit leakage is detected, reserve pit use at the site would be curtailed, as directed by the BLM, until the leakage is corrected.
- All reserve pits would be designed with at least 1.0 ft of free board.
- All water used in association with this project would be obtained from WSEO-permitted ground water wells.
- The discharge of all water (stormwater, produced water) would be done in conformance with WDEQ-WQD, BLM, and WOGCC rules and regulations (WDEQ 1978; BLM Onshore Oil and Gas Order No. 7).
- Concentrated water flows within access road ROWs would be managed utilizing best management practices as described in Appendix A.
- Operators would prepare SWPP Plans for all disturbances greater than 5 acres in size as required by WDEQ NPDES permit requirements. In some instances, SWPP Plans for groups of wells may be developed.
- Operators would implement SPCC Plans, where applicable, in accordance with 40 C.F.R. 112.
- BLM/WOGCC casing and cementing criteria would be followed to protect all subsurface mineral- and water-bearing zones.

Additional Potential BLM-Required Mitigation

Pipelines and roadways may be required to follow existing ROWs. Established crossings, culverts, or temporary bridges may be utilized. Culverts would be installed at all appropriate locations as specified in the *Manual 9112-Bridges and Major Culverts* and *Manual 9113-Roads* (BLM 1985, 1991a). All stream crossing structures may be designed to carry the 25-year/24-hr discharge event or other capacities as directed by the BLM. Temporary channel stabilization techniques (e.g., riprap) and diversions may be used, if necessary, to minimize erosion and sedimentation during construction in channels.

Operators would ensure that state and federal water quality standards would not be exceeded through appropriate disposal of produced water as directed by the WOGCC and BLM, and the prudent use of erosion control measures and timely revegetation of disturbed areas. All disposal of produced water would be approved by the BLM and/or WDEQ.

Proper containment of oil and fuel in storage areas, containment of fluids in reserve pits, and location of wells away from drainages would be employed to minimize potential surface water impacts. Guidelines specified in SPCC Plans would be adhered to such that any spill or accidental discharge of a hazardous material would be remediated (e.g., contaminated soils from accidental spills would be cleaned up immediately). An orientation may be required of responsible or supervisory individuals to ensure that these people are aware of the potential impacts that can result from accidental spills, and that they know the appropriate recourse in the event that a spill occurs. Streams at pipeline crossings would be protected from contamination by a pipeline break with shutoff valves or other systems capable of minimizing accidental discharge.

Construction in erosion-prone or high-salinity areas may be restricted, and necessary construction in these areas may be authorized only in the late summer, fall, and winter to avoid peak runoff periods. Proper containment of oil and produced water in tanks and drilling fluids in reserve pits and the location of staging areas for storage of equipment away from drainages would be required to prevent potential contaminants from entering surface waters.

Prudent use of erosion control measures including diversion terraces, riprap, matting, temporary sediment traps, water bars, and timely revegetation, in addition to measures described in Appendix A, may be employed as necessary. Interceptor dikes may be used to control surface runoff generated at well locations, and dike location and construction methods would be described in drill site design plans. If necessary to reduce suspended sediment loads and remove potential contaminants, the Operators may be required to treat diverted water in detention ponds prior to release. Prior to discharge, water would be treated or filtered if necessary to reduce contaminant levels and/or reduce suspended particles to meet applicable state or federal standards. If water is discharged into an established drainage channel, the rate of discharge would not exceed the capacity of the channel to convey the increased flow. Waters that do not meet applicable state or federal standards would be evaporated, treated, or disposed of at an approved disposal facility. SWPP Plans would be prepared as necessary.

Reserve pits may require lining in the following situations:

- where soils would not hold fluids;
- within 500 ft of open water or wetlands;
- within 100 ft of ephemeral or intermittent drainages; or
- where shallow aquifers (e.g., within 20 ft of the surface) are likely to be encountered.

These determinations would be made on a case-by-case basis during the APD review process, and soil hydraulic conductivity tests may be required. Where reserve pit fluids contain oil, toxic substances, or other contaminants, Operators would employ approved on-site methods of disposal or permanent off-site disposal at evaporation ponds or injector wells developed in accordance with WDEQ regulations. Reserve pit fluids may be removed through evaporation, approved solidification procedures, or pumping to trucks for transport to and disposal at approved and permitted facilities. All methods would be approved by the Authorized Officer.

All wells would be cased and cemented to depths below accessible fresh water zones to prevent cross-contamination of aquifers. Uneconomical wells and wells that have completed their intended purpose would be properly abandoned and plugged using procedures identified by the Office of State Oil and Gas Supervisor, rules and regulations of WOGCC (1998), and the BLM.

Water that does not meet applicable state and federal surface or ground water standards would not be released on the ground surface. This water may require treatment in a lined treatment pond prior to discharge or may be transported away from well locations to lined evaporation ponds or injector wells for disposal. In the event that produced water quality at a specific well is determined to be of suitable quality, NPDES permits may be obtained, and the water may be discharged on the ground surface in an appropriate manner after consultation with the WDEQ, BLM, WGFD, and potentially affected livestock permittees. All disposal of produced and test water would be in accordance with WDEQ rules and regulations and BLM On-shore Oil and Gas Order No. 7.

Additional monitoring and erosion and runoff control measures may be applied on disturbed areas in the Antelope/Bitter Creek drainage to ensure no further degradation of stream channels.

To protect surface waters from potential depletion, the BLM may require that water wells be drilled to depths of greater than 1,000 ft. Additionally, the BLM may not allow water wells to produce from the Laney Member of the Green River Formation near Antelope Creek or the Wasatch Formation near Muddy Creek.

Operators may be required to conduct visual monitoring reconnaissance of surface waters to detect changes in water quality resulting from sedimentation. Periodic water samples may be collected, analyzed, and evaluated to ensure that produced water and water disposal methods, as well as any on-site discharge, are in compliance with federal and state water quality standards. In addition, if waters are discharged to the surface, the quantity of water discharged would be regularly monitored to ensure that releases do not exceed the abilities of existing drainage systems to convey discharge flows. Appropriate remedial actions may be required to correct any out-of-compliance conditions.

4.1.7.6 Cumulative Impacts

Since no surface water is proposed for use during the development of the CD/WIIPA, there would be no increase in cumulative impacts to surface water quantities resulting from this project. Surface water quality would be protected using measures similar to those described for the Proposed Action for all other projects in the vicinity of the CD/WIIPA, and thus, cumulative impacts to surface water quality are anticipated to be insignificant.

While total ground water reserves for the region have not been determined, existing data suggest that sufficient quantities of ground water are available (see Section 3.1.6.2). The cumulative volume of ground water anticipated for consumption from this and other projects in combination is relatively small compared with existing regional water supplies (BLM 1994a). Cumulative impacts to ground water quantity are expected to be insignificant.

All the proposed regional oil and gas development projects would use mitigation measures similar to those described for the Proposed Action to prevent ground water pollution. Therefore, cumulative impacts to ground water quality are expected to be insignificant.

4.1.8 Noise and Odor

The BLM GDRA and GRRA RMPs (BLM 1990a, 1977a) and state (WSLUC 1979) and local (THK 1977; UW 1991; Pedersen Planning Consultants 1997, 1998) land use plans do not specifically address management objectives associated with noise and odor.

The following analysis indicates that impacts from the Proposed Action and alternatives would likely be insignificant. However, in the event that project noise results in the displacement of area residents, significant impacts could occur.

4.1.8.1 Proposed Action

Perceived sound levels from oil and gas operations are determined by the loudness and pitch of the sound at the source, the listener's distance from the source, air temperature, humidity, turbulence, wind gradient, and screening effects from terrain or vegetation (Engineering Dynamics 1984). The Proposed Action would generate noise through well location, road, and pipeline construction; drilling, testing, production, and ancillary facility operations; vehicle traffic; site rehabilitations; and potential seismic operations. Project-required noise may adversely affect area residents, and if residents are displaced as a result of noise, significant impacts could result. Drill rig and flaring operations in the CD/WIIPA are anticipated to have noise levels of less than 100 dBA at their sources and less than 60 dBA at 0.25 mi.

While it is speculated that noise may adversely affect strutting sage grouse, no data are available regarding potential impacts from project-required noise on sage grouse strutting. Nonetheless, no surface disturbance and associated noise emanation sources would occur on public lands within 0.25 mi of sage grouse leks, and activities on public lands within 2.0 mi of leks would be restricted during the nesting period as deemed appropriate by the BLM.

Project-required noise may also adversely affect raptor nesting in the CD/WIIPA. However, these impacts are not anticipated to be significant due to the seasonal avoidance measure proposed by Operators (see Section 4.2.3.2).

Increased noise levels associated with drilling rigs, completion, flaring activities, and other construction equipment employed during peak activity periods are anticipated to constitute short-term insignificant impacts during construction, drilling, completion, and testing. Increased traffic throughout the LOP and noise from production equipment are anticipated to constitute long-term insignificant noise impacts.

Odors present periodically at well and ancillary facility locations and along roadways could offend area residents and users in the vicinity of emission sources. Odors associated with drilling and production operations in the CD/WIIPA are not hazardous, and impacts from odors would likely be negligible for the LOP due to wind dispersal. Natural gas from the target formations does not contain H_2S, and therefore, no H_2S odor or health hazards would be present. No significant impacts from project odors are anticipated.

4.1.8.2 Alternative A

Impacts resulting from noise and odor under the implementation of Alternative A would be reduced from those of the Proposed Action due to the reduced level of allowable surface disturbance in SRAs (14-acre maximum per federal section) which include residential areas and areas with high raptor nesting densities. The reduction in surface disturbance on public lands in these areas is anticipated to result in decreased noise and odor impacts. Noise and odor impacts under Alternative A are anticipated to be insignificant initially and for the LOP. Some increase in noise impacts on private lands and public lands adjacent to SRAs may occur under implementation of Alternative A.

4.1.8.3 Alternative B

Impacts resulting from noise and odor under implementation of Alternative B would be reduced from those of the Proposed Action, but increased from those of Alternative A. The levels of allowable surface disturbance in SRAs which include residential areas and areas with high raptor nesting densities is set at a maximum of 30 acres/federal section. The reduction in surface disturbance on public lands in these areas is anticipated to result in decreased noise and odor impacts. Noise and odor impact levels under Alternative B are anticipated to be the same as those of Alternative A (i.e., insignificant). Some increase in noise impacts on private and public lands adjacent to SRAs may occur under Alternative B.

4.1.8.4 No Action

No impacts from noise and odor above existing authorized levels would occur under the No Action Alternative. Noise and odor impacts under this alternative are anticipated to be insignificant. An estimated 845 well locations and associated facilities may be developed in the CD/WIIPA under this alternative. In the absence of further development on CD/WIIPA lands, no further noise and/or odor impacts would occur.

4.1.8.5 Mitigation and Monitoring

Applicant-Committed Measures

Operators would ensure that all motorized equipment is muffled and maintained.

Additional Potential BLM-Required Mitigation

Noise mitigations (e.g., equipment housing) may be applied at well locations, as determined necessary on a case-by-case basis by the BLM. Construction, drilling, completion, testing, and production facility installation activities may be limited within 0.25 mi or other distance of occupied residences, on crucial big game ranges during critical winter periods, within 1.0 mi of active raptor nests during the breeding and nesting period, and within 0.25 mi of sage grouse leks at all times and within 2.0 mi of leks during the nesting season. Road use specifications designed to keep traffic to a minimum as identified in site-specific transportation plans may be required to further reduce noise impacts.

The BLM may require mitigations for odor including: modification of tanks to reduce flashing, appropriate containment of odiferous fluids, timely removal of drilling fluids from locations, accelerated well site reclamation, and/or other measures as deemed appropriate by the BLM.

4.1.8.6 Cumulative Impacts

The incremental increase in cumulative impacts resulting from past, present, and potential future project noises and odors would likely occur at insignificant levels for the CD/WIIPA and surrounding 1-mi buffer (i.e., the cumulative impact assessment area for noise and odor [see Table 4.1]). Impacts would be of the same type as those described for the Proposed Action and would primarily occur at or near development locations; however, noise and odor impacts may augment the level of impacts to other resources present in the area (e.g., increased acreage of wildlife habitat loss [displacement], increased impacts to recreational users), but these impacts are anticipated to be insignificant for most species and area users (see Sections 4.2.3 and 4.5.1.2).

4.2 BIOLOGICAL RESOURCES

4.2.1 Vegetation

The BLM GDRA and GRRA RMPs (BLM 1990a, 1997a) and Standards for Healthy Rangelands (BLM 1997b) and state (WSLUC 1979) and local (THK 1977; UW 1991; and Pedersen Planning Consultants 1997, 1998) land use plans address the following management objectives associated with vegetation:

- to maintain or enhance vegetation community health, composition, and diversity in order to meet watershed, wild horse, and wildlife resource management objectives;
- to provide for plant diversity (desired plant communities) to meet livestock management, watershed, wild horse, and wildlife objectives;
- to improve forage production and ecological conditions for the benefit of livestock use, wildlife habitat, watershed, and riparian habitat;

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- to restore, maintain, or improve riparian habitat to enhance forage conditions, wildlife habitat, and stream quality;
- to achieve proper functioning condition or better on riparian areas;
- to maintain or improve surface and ground water quality;
- to protect, maintain, or improve wetlands, floodplains, and riparian areas;
- to ensure soils are stable and provide for optimal plant growth;
- to sustain rangelands capable of supporting viable populations and a diversity of native plant species; and
- to ensure upland vegetation consists of plant communities, appropriate to each ecological site, that are resilient, diverse, and able to recover from natural and human disturbance.

The following analysis shows that the Proposed Action and alternatives are generally compatible with these management objectives; however, significant impacts could occur in dunal areas if reclamation efforts are unsuccessful and stabilized dunes are reactivated.

4.2.1.1 Proposed Action

Removal of vegetation, temporary changes in vegetation types (e.g., shrubland to grassland conversions), weed infestations, unsuccessful reclamation, and the potential for accelerated erosion constitute both potential short-term and LOP impacts. With the implementation of applicant-committed mitigation measures (see Section 4.2.1.5 and Appendix A), impacts to vegetation resulting from the Proposed Action are anticipated to be insignificant initially, for the LOP, and beyond; however, in dunal areas, where reclamation efforts may initially be unsuccessful, significant impacts could result.

Of the 33,600 acres of initial project-required surface disturbance, approximately 22,100 acres of the Wyoming big sagebrush vegetation type, 5,800 acres of greasewood fans and flats, 3,300 acres of desert shrub, 1,300 acres of basin exposed rock/soil, 700 acres of saltbush fans and flats, 300 acres of shrub-dominated riparian, and less than 50 acres each of the mixed grass prairie and unvegetated playa types would be disturbed (Table 4.9). The LOP surface disturbance of 15,900 acres would include 10,400 acres of Wyoming big sagebrush, 2,600 acres of greasewood fans and flats, 1,600 acres of desert shrub, 700 acres of basin exposed rock and soil, 300 acres of saltbush fans and flats, 200 acres of shrub-dominated riparian, and less than 50 acres each of mixed grass prairie and unvegetated playa types.

Some additional indirect disturbance of vegetation may also occur adjacent to disturbed areas from soil transport off disturbed areas onto undisturbed vegetation. Soil may be redistributed to undisturbed vegetated areas by wind or water, and this indirect disturbance would likely be greatest adjacent to roadways and other linear disturbances. Further, on private lands where roads may not be built to BLM road standards, these impacts could be increased.

Approximately 1,300 acres of initial surface disturbance and 660 acres of LOP surface disturbance would occur to vegetation on sandy soil areas, which include stabilized dunes (see Table 4.8), and revegetation at these and other locations could be inhibited by arid conditions and/or other limitations during some years. CD/WIIPA Operators and the BLM would monitor reclamation success on all reclaimed areas as identified in the Reclamation Plan (Appendix A), and reclamation efforts would continue until successful reclamation is achieved.

4.2.1.2 Alternative A

Under Alternative A, the total area of initial and LOP vegetation disturbance would likely be similar to that occurring under the Proposed Action (Table 4.9). However, because the area of disturbance in SRAs (which include areas with stabilized sand dunes) likely would be reduced, impacts would be reduced from those of the Proposed Action (see Table 2.2). Some increase in vegetation disturbance on private lands in the CD/WIIPA likely would occur under Alternative A.

4.2.1.3 Alternative B

Under Alternative B, the total area of initial and LOP vegetation disturbance would likely be similar to that occurring under the Proposed Action (Table 4.9); however, because the area of disturbance in SRAs likely would be reduced (see Table 2.2) and mitigation and reclamation measures would be implemented, impacts to vegetation would likely be insignificant initially and for the LOP under this alternative. Some

Table 4.9 Existing, Proposed, and Potential Future Surface Disturbance Acreage Within Affected Vegetation Types, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

	Acreage		Project-Required[1]			Potential	
Vegetation Type	CD/WIIPA	GCIAA	Initial	LOP	GCIAA[2]	Future GCIAA	Cumulative Total[3]
Wyoming big sagebrush	731,900	2,972,000	22,100	10,400	51,400	7,800	69,600
Greasewood fans and flats	151,100	385,000	5,800	2,600	6,700	1,000	10,300
Desert shrub	97,100	427,000	3,300	1,600	7,500	1,100	10,200
Basin exposed rock/soil	31,000	112,000	1,300	700	1,900	300	2,900
Saltbush fans and flats	40,600	172,000	700	300	2,900	500	3,700
Shrub-dominated riparian	4,500	48,000	300	200	900	200	1,300
Mixed grass prairie	1,600	13,000	<50	<50	200	<50	<300
Unvegetated playa	3,400	15,000	<50	<50	300	<50	<400
Other[4]	0	346,000	0	0	6,700	900	7,600
Total	1,061,200	4,490,000	33,600	15,900	78,500	11,900	106,300

[1] Adapted from Table 2.1 and includes areas of existing disturbance required for the proposed project.

[2] Does not include existing disturbance required for the proposed project which is included as project-required disturbance.

[3] Includes all project-required (LOP), existing, and potential future surface disturbance in GCIAA.

[4] Includes all vegetation types on the GCIAA not affected by the proposed project.

increase in vegetation disturbance on private lands in the CD/WIIPA likely would occur under Alternative B. Impacts to vegetation under Alternative B would likely be less than those of the Proposed Action, but somewhat increased from those of Alternative A.

4.2.1.4 No Action

Under the No Action Alternative, impacts to vegetation would continue to occur at currently allowable levels, and no significant impacts to vegetation are anticipated. However, impacts to vegetation under this alternative could be increased from those of the Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts (see Appendices A and B). Existing long-term disturbance in the CD/WIIPA totaling 14,800 acres (1.4% of the area) would continue for current CD/WIIPA land uses (see Table 4.2), and commensurate with existing oil and gas development policy, an estimated additional 6,400 acres of new disturbance and 2,400 acres of new long-term disturbance would likely result from future oil and gas exploration and development in the CD/WIIPA (see Table 2.1). Total surface disturbance in the CD/WIIPA under the No Action Alternative is estimated to be 24,800 acres (2.3% of the area) initially and 17,200 acres (1.6%) for the long-term (i.e., 30-50 years). Further, an estimated 320 acres of long-term disturbance could occur on stabilized dunes, and if dunes are reactivated (i.e., reclamation efforts are inadequate), significant adverse impacts could result. In the absence of further CD/WIIPA developments, vegetation on the CD/WIIPA would remain unchanged from that existing today.

4.2.1.5 Mitigation and Monitoring

Applicant-Committed Measures

- Operators would finance site-specific surveys for federally listed T&E, candidate, and proposed plant species and plant Species of Special Concern (former USFWS Category 2 candidate species) prior to any surface disturbance in areas determined by the BLM to contain potential habitat for such species (BLM Directive USDI-BLM 6840). These surveys would be completed by a qualified botanist as authorized by the BLM, and this botanist would be subject to BLM's special status plant survey policy requirements. Data from these surveys would be provided to the BLM, and if any T&E, candidate, proposed, or special status plant species or their habitats are found, BLM recommendations for avoidance or mitigation would be implemented. Minor relocation of project facilities would be made to avoid these species and/or their habitat. If avoidance is not possible, informal consultation with the USFWS would be initiated, as necessary.
- Herbicide applications would be kept at least 500 ft from known special status plant populations.
- Removal or disturbance of vegetation would be kept to a minimum through construction site management (e.g., by utilizing previously disturbed areas, using existing ROWs, designating limited equipment/materials storage yards and staging areas, scalping, etc.).
- Operators would seed and stabilize disturbed areas in accordance with the reclamation guidelines presented in Appendix A.
- Operators would monitor for noxious weeds and would apply BLM-approved weed control techniques (e.g., soil sterilants, biological controls), as necessary.

Additional Potential BLM-Required Mitigation

Additional mitigation measures to limit vegetation impacts may include further minimizing the size of disturbance, using appropriate erosion and sedimentation controls, augmenting weed control practices, and/or implementing prompt revegetation using appropriate locally adapted seed mixtures. Operators may be required to adhere to all reclamation guidelines presented in the Reclamation Plan for this project (see Appendix A).

Well locations and associated roads and pipelines may be restricted in some locations to avoid and/or minimize impacts to areas of high value (e.g., sensitive plant habitats, wetlands, riparian areas). Vegetation scalping may be required during pipeline construction.

Augmented erosion and sedimentation control techniques may be required to be incorporated by

Operators into the design of well locations, roads, pipelines, and other facilities. Revegetation using a BLM-approved locally adapted seed mixture containing grasses, forbs, and shrubs may be required for the first appropriate season following disturbance. Vegetation removed would be replaced with plants of equal value using procedures that include:

- fall reseeding (September 15 to freeze-up), where feasible;
- spring reseeding (prior to April 15) if fall seeding is not feasible;
- deep ripping of compacted soils prior to reseeding;
- surface pitting/roughening prior to reseeding;
- utilization of native cool season grasses, forbs, and shrubs in the seed mix;
- utilization of BLM-approved introduced/adapted species (e.g., crested wheatgrass) in the seed mix on selected areas and after all attempts at vegetation reestablishment with native species are unsuccessful;
- appropriate BLM-approved weed control techniques;
- broadcast or drill seeding depending on site conditions;
- fencing of certain reclamation sites (e.g., riparian areas, steep slopes, areas where grazing may affect reclamation success) as determined necessary by the BLM; and
- other procedures identified in Appendix A.

Recontouring and seedbed preparation would be required prior to reseeding on the unused portion of well locations, road ROWs, and entire pipeline ROWs outside of road ROWs. In the event of uneconomical wells, Operators would be required to initiate reclamation of the entire well location, access road, and adjacent disturbed habitat as soon as practical. Reclamation may be monitored annually or as specified in site-specific reclamation plans to determine and ensure successful establishment of vegetation (see Appendix A).

Operators may be required to implement a noxious weed control program in cooperation with the BLM and Sweetwater or Carbon County to ensure noxious weed invasion does not become a problem (see Appendix A). Weed-free certification by Weed and Pest District agents would be required for grain, straw, or hay used for mulching revegetated areas.

Operators, in cooperation with the BLM, may be responsible for monitoring revegetation success using criteria specified in Appendix A and site-specific reclamation plans. The reclamation monitoring program may include written documentation to be furnished to the BLM regarding the effectiveness and success of reclamation.

Under Alternatives A and B, the BLM may require the increased use of fencing to facilitate shrub and forb establishment within SRAs, most notably on crucial winter ranges and VRM Class II areas.

4.2.1.6 Cumulative Impacts

Table 4.9 identifies all known existing, proposed, and potential future disturbance in the GCIAA. The temporary loss of vegetation on disturbed areas reflects a shift in primary land use from livestock grazing and wildlife habitat to industrial use on 2.4% (106,300 acres) of the 4,490,000-acre GCIAA. The primary measures for reducing cumulative impacts would be successful revegetation with adapted native plant species. It is assumed that successful revegetation would be accomplished (see Appendix A), and therefore, postdevelopment land use, productivity, plant species diversity, ground cover, wildlife habitat, and weed control goals would be achieved, and cumulative impacts would be insignificant. All of the vegetation types impacted by the proposed project are common regionally.

4.2.2 Wetlands and Riparian Areas

The BLM GDRA and GRRA RMPs (BLM 1990a, 1997a) and Standards for Healthy Rangelands (BLM 1997b) and state (WSLUC 1979) and local (THK 1977; UW 1991; Pedersen Planning Consultants 1997, 1998) land use plans address the following management objectives associated with wetlands and riparian areas:

- to protect, maintain, or improve wetlands, floodplains and riparian areas;
- to enhance forage conditions, provide wildlife habitat, and improve stream quality;
- to enhance or maintain riparian habitats by managing deep-rooted native herbaceous or woody vegetation;
- to improve forage production and ecological conditions for the benefit of livestock use,

wildlife habitat, watershed, and riparian habitat;

- to restore, maintain, or improve riparian habitat to enhance forage conditions, wildlife habitat, and stream quality;
- to ensure riparian and wetland vegetation has appropriate structural, age, and species diversity characteristics and is resilient and capable of recovering from natural and human disturbance in order to provide forage and cover;
- to achieve PFC or better on riparian areas;
- to maintain or improve surface and ground water quality; and
- to achieve a healthy and productive condition for long-term benefits and values in concert with range, watershed, and wildlife needs.

The following analysis shows that the Proposed Action and alternatives generally are compatible with these management objectives. However, significant impacts could occur if runoff and sedimentation from project-affected areas results in the loss of PFC in area drainages.

4.2.2.1 Proposed Action

Direct impacts to wetlands and riparian areas would occur temporarily only as a result of road and pipeline crossings. Other project-required facilities (e.g., well location, water disposal sites, compressor facilities, gas processing plants) would not be located within 500 ft of wetlands or open water or within 100 ft of ephemeral or intermittent channels. Indirect impacts to wetlands and riparian areas would occur as a result of increased sediment deposition in these areas, and if these impacts result in the loss of PFC; significant impacts could occur. However, since project activities would comply with Section 404 of the *Clean Water Act* and there would be no net loss of wetlands, impacts to wetlands and riparian areas are anticipated to be insignificant.

Based on the percentage of the CD/WIIPA occupied by the shrub-dominated riparian vegetation types (0.4%, 4,500 acres), maximum LOP disturbance in these areas would be approximately 200 acres (Table 4.9). Maximum LOP disturbance would be less than 100 acres in the 9,200 acres (0.9% of CD/WIIPA) of potential wetlands on the area since these areas would be avoided where possible. Additionally, impacts to riparian and wetland areas would be distributed among five watersheds (see Map 4.2) such that no more than 70 acres of disturbance (Great Divide Basin Watershed) would likely occur in any one watershed.

4.2.2.2 Alternative A

Potential impacts to wetlands and riparian areas under Alternative A likely would be the same as described for the Proposed Action (i.e., insignificant).

4.2.2.3 Alternative B

As with the Proposed Action and Alternative A, there would be no net loss of wetlands under Alternative B, and project activities under this alternative would comply with Section 404 of the *Clean Water Act*; therefore, impacts to wetlands and riparian areas would be insignificant.

4.2.2.4 No Action

There would be no impacts to wetlands or riparian areas beyond currently existing and authorized levels under the No Action Alternative. However, impacts to wetlands and riparian areas under this alternative could be increased from those of the Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts (see Appendices A and B). Additional development in the CD/WIIPA would occur at authorized levels, and associated impacts would be consistent with current management objectives. An estimated 16 acres of new long-term surface disturbance would occur in riparian areas, and less than 20 acres of surface disturbance would occur in potential wetlands under the No Action Alternative. In the absence of further CD/WIIPA developments, no impacts to wetland/riparian areas would occur, and these features would remain unchanged from those existing today.

4.2.2.5 Mitigation and Monitoring

Applicant-Committed Measures

- Operators would evaluate all project facility sites for occurrence of waters of the U.S., special aquatic sites, and wetlands, per COE requirements. All project activities would be

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located outside of these sensitive areas, where practical.

- Where wetlands, riparian areas, streams, and ephemeral/intermittent stream channels must be disturbed, COE Section 404 permits would be obtained as necessary, and the following measures would be employed.
  - Wetland areas would be crossed during dry conditions (i.e., late summer, fall, or dry winters); winter construction activities would occur only prior to soil freezing or after soils have thawed.
  - Streams, wetlands, and riparian areas disturbed during project construction would be restored to pre-project conditions, and if impermeable soils contributed to wetland formation, soils would be compacted to reestablish impermeability.
  - Wetland topsoil would be selectively handled.
  - Recontouring and BLM-approved species would be used for reclamation.
  - Reclamation activities would begin on disturbed wetland areas immediately after completion of project activities.

Additional Potential BLM-Required Mitigation

Operators may be required to use established crossings or temporary bridges, and all staging areas may require placement away from wetland sites. Avoidance of all wetland/riparian areas may be required, and Operators may be required to monitor activities adjacent to wetlands to ensure that no discharge or fill would disturb these areas.

Where wetland areas must be crossed, as determined during site-specific EA preparation, site reclamation may include alternative soil stabilization and vegetation cover reestablishment methodologies. Exact procedures and species used would be dependent on site-specific objectives. Compliance with the *Clean Water Act*, Executive Orders 11988 (floodplain protection) and 11990 (wetland protection) would be assured through consultation with the BLM and COE and the associated Section 404 permitting process. The BLM would require no net loss of wetlands from this project.

4.2.2.6 Cumulative Impacts

The cumulative impacts analysis area for wetlands and riparian areas is the affected watersheds within the GCIAA (see Table 4.1 and Map 4.2). Within this area, riparian and wetland habitats are primarily found along drainages and dispersed at ponds and reservoirs. Existing adverse impacts include some roads within these habitats, livestock grazing, and recreational use. Both wetlands and riparian areas would be avoided where possible by this and most other proposed projects in the area, so there would be insignificant direct impacts to these resources. Indirect impacts to wetland and riparian areas would be limited to increased sediment deposition. A beneficial impact to riparian habitat would occur with planned improvements in grazing management. No permanent cumulative impacts are anticipated since all future development activities would comply with Section 404 of the *Clean Water Act* and Executive Order 11990. Avoidance and mitigation measures described for the Proposed Action would be applied pursuant to COE recommendations for all developments in the GCIAA.

Potential wetland habitat in the GCIAA (49,400 acres) accounts for approximately 1.1% of the total area (4,490,000 acres), and the majority of this habitat is contained within the approximately 48,000 acres of the riparian shrub vegetation type present on the GCIAA. Total existing, proposed, and potential future disturbance in wetland/riparian areas is anticipated to result in a maximum of approximately 1,400 acres of surface disturbance, the majority of which (900 acres) is existing disturbance. This disturbance would be distributed among five watersheds (see Map 4.2 and Table 4.7) such that the maximum estimated disturbance of wetland/riparian areas in any one watershed would be approximately 600 acres in the Great Divide Basin Watershed. Approximately 400 acres and 200 acres of cumulative wetland/riparian area surface disturbance would occur in the East Bitter Creek and Muddy Creek Watersheds, respectively, and less than 100 acres of cumulative wetland/riparian area surface disturbance would occur in each of the Northwest Little Snake and Northeast Vermillion Creek Watersheds.

4.2.3 Wildlife and Fisheries

The BLM GDRA and GRRA RMPs (BLM 1990a, 1997a) and Standards for Healthy Rangelands (BLM 1997b) and state (WSLUC 1979) and local (THK 1977; UW 1991; Pedersen Planning Consultants 1997, 1998) land use plans address the following management objectives associated with wildlife and fisheries:

- to maintain, improve, or enhance the biological diversity of plant and wildlife species while ensuring healthy ecosystems;
- to restore disturbed or altered habitat with the objectives to attain desired native plant communities, while providing for wildlife needs and soil stability;
- to enhance or maintain riparian habitats by managing deep-rooted native herbaceous or woody vegetation;
- to provide habitat quality (food, cover, space, and water) adequate to support a natural diversity of wildlife and fisheries, including big game; upland game; waterfowl; nongame species; game fish; T&E and sensitive species; and species of special management interest in Wyoming; as well as to assist in meeting goals of recovery plans;
- to maintain or improve overall ecological quality, thus providing good wildlife habitat, within the constraints of multiple-use management in moderate and low-priority standard habitat sites;
- to promote the sound management of wildlife to achieve the optimum mix of species and habitat, including the reduction of numbers where severe overpopulation competes with agriculture;
- to protect unique natural areas and endangered wildlife species by encouraging development that reduces unfavorable impacts on fragile areas;
- to conserve the crucial winter range of big animals;
- to integrate the consideration of crucial winter ranges for big game animals into future land management decisions;
- to improve forage production and ecological conditions for the benefit of livestock use, wildlife habitat, watershed, and riparian habitat;
- to restore, maintain, or improve riparian habitat to enhance forage conditions, wildlife habitat, and stream quality;
- to manage resources so that productivity of nesting raptor pairs is maintained, while allowing for development of coal and oil, and to seek the cooperation of owners of adjacent property in management of raptor nesting habitat;
- to maintain or improve vegetation condition and/or avoid long-term disturbance in high-priority standard habitat sites and fisheries areas; and
- to sustain rangelands capable of supporting viable populations and a diversity of animal species.

The following analysis shows that the Proposed Action and alternatives generally are compatible with these management objectives; however, significant impacts could occur from indirect disturbance to big game on their winter ranges and/or raptor nest abandonment and/or reproductive failure under the Proposed Action.

Impacts to wildlife resources from construction, drilling, and completion activities would generally be through loss of habitat and disruption of activities due to human presence. Impacts to wildlife would continue during the LOP as a result of disturbance from increased human activities. Given adherence to wildlife protection measures identified in Appendix D, impacts to most wildlife resources are anticipated to be insignificant during the initial construction phase, for the LOP, and until human presence is reduced and areas are adequately revegetated.

4.2.3.1 Big Game/Other Mammals

Direct impacts to big game species habitats (i.e., surface disturbance) were only assessed for affected crucial winter ranges and winter ranges since these range types tend to be limiting for most herds. While reclamation of the well location and ROW areas would begin on nonessential areas as soon as possible following well testing and pipeline installation, and these areas would provide grasses for forage within a few years, sagebrush and other winter forage would likely take from three to 20 years to become established (Plummer et al. 1968; Environmental

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Studies Board 1974; Fisser 1981; Wasser and Shoemaker 1982). Severson et al. (1968) reported that browse constituted as much as 98% of the winter forage of pronghorn in the Red Desert of Wyoming. Sagebrush was the major item eaten by pronghorn during winter and spring in the same area (Severson and May 1967). Mule deer and elk may also rely heavily on sagebrush and other shrubs during the winter months.

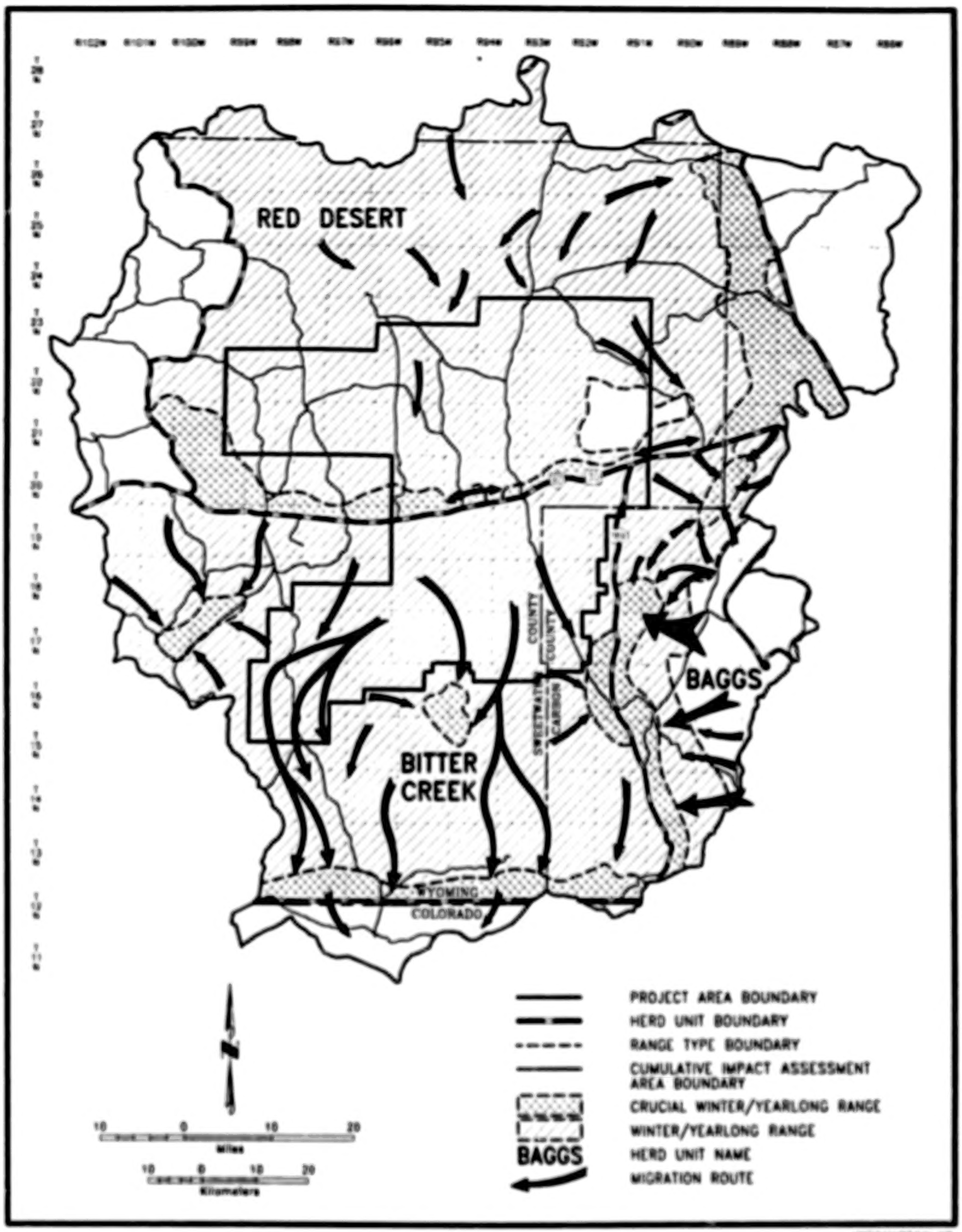
Proposed Action. Pronghorn crucial winter range affected by the Proposed Action occurs for the Red Desert and Bitter Creek Herds (Map 4.3). Approximately 90 of the 3,000 proposed well locations (3.0%) would be drilled within crucial winter/yearlong range for the Red Desert pronghorn herd, and total initial and LOP surface disturbance would cover approximately 1,032 acres and 534 acres, respectively (Table 4.10). This range reduction represents a LOP loss of approximately 1.7% of the crucial winter/yearlong range for the Red Desert herd within the CD/WIIPA and approximately 0.2% of all the crucial winter range for the herd. Total initial and LOP surface disturbance within winter/yearlong range for the herd would be approximately 16,306 acres and 8,437 acres, respectively. LOP surface disturbance in winter/yearlong range for the Red Desert herd within the CD/WIIPA would be less than 1.7% of the entire winter/yearlong range for the herd. Total initial and LOP surface disturbance for the Bitter Creek pronghorn crucial winter/yearlong range would approximate 34 acres and 18 acres, respectively. LOP reduction of this range represents 7.6% of this range type on the CD/WIIPA and less than 0.1% of the entire Bitter Creek Herd crucial winter/yearlong range. Direct surface disturbance within winter/yearlong range for the Bitter Creek and Baggs pronghorn herds would be 15,583 and 275 acres initially and 8,003 and 143 acres for the LOP, respectively (Table 4.10). Impacts to pronghorn antelope resulting from direct habitat loss under the Proposed Action Alternative are anticipated to be insignificant initially and for the LOP.

Thirty-three of the proposed well locations would be located within crucial winter/yearlong range for the Baggs mule deer herd, which would be the only crucial mule deer range affected by the Proposed Action (Map 4.4). Approximately 378 acres of this range would be lost initially and 196 acres would be lost for the LOP (Table 4.10). This habitat reduction represents an initial loss of approximately 3.2% and 1.6% of the crucial winter/yearlong mule deer range for the Baggs herd within the CD/WIIPA. LOP loss of this range type for the entire herd would be less than 0.1%. Direct surface disturbance of winter/yearlong range for the Baggs mule deer herd would be 14,138 acres initially and 7,316 acres for the LOP (Table 4.10). LOP loss of this range type represents approximately 1.7% of the type on the CD/WIIPA and 0.5% of the type for the entire herd. Direct surface disturbance within winter/yearlong range for the Steamboat and South Rock Springs mule deer herds would be 1,376 acres and 344 acres initially and 712 acres and 178 acres for the LOP, respectively. Impacts to mule deer resulting from direct habitat loss under the Proposed Action are anticipated to be insignificant initially and for the LOP.

Fifty-one wells would be located in crucial winter/yearlong range for the Steamboat elk herd and 162 wells would be located in other winter ranges for the herd (Map 4.5). No crucial or winter ranges for the Shamrock elk herd would be affected by the Proposed Action. The initial and LOP disturbance of crucial elk range for the Steamboat elk herd would be 585 acres and 303 acres, respectively, and initial and LOP disturbance in other winter ranges would be 1,892 acres and 979 acres, respectively (Table 4.10). LOP disturbance with crucial winter/yearlong range represents 1.7% of this range on the CD/WIIPA and 0.1% of this range type for the entire herd. Direct impacts to elk resulting from habitat loss under the Proposed Action are anticipated to be insignificant initially and for the LOP.

While individual well locations, ancillary facilities sites, and some reclamation areas would be fenced if necessary to protect these areas during plant establishment, no extensive fencing of ROWs (i.e., roads and pipelines) would be used. Therefore, big game migration through the CD/WIIPA is not anticipated to be significantly affected.

Mortality is a potential direct impact that may occur due to road kill associated with increased traffic in the CD/WIIPA for the LOP. Construction of roads utilizing safe design criteria and employee education regarding safe operating procedures would prevent major losses to big game and other mammal populations, thereby reducing the effect of vehicle collisions to insignificant levels for the LOP.



Map 4.3 Regional Pronghorn Ranges, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Table 4.10 Acreage of Direct Surface Disturbance in Big Game Ranges, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

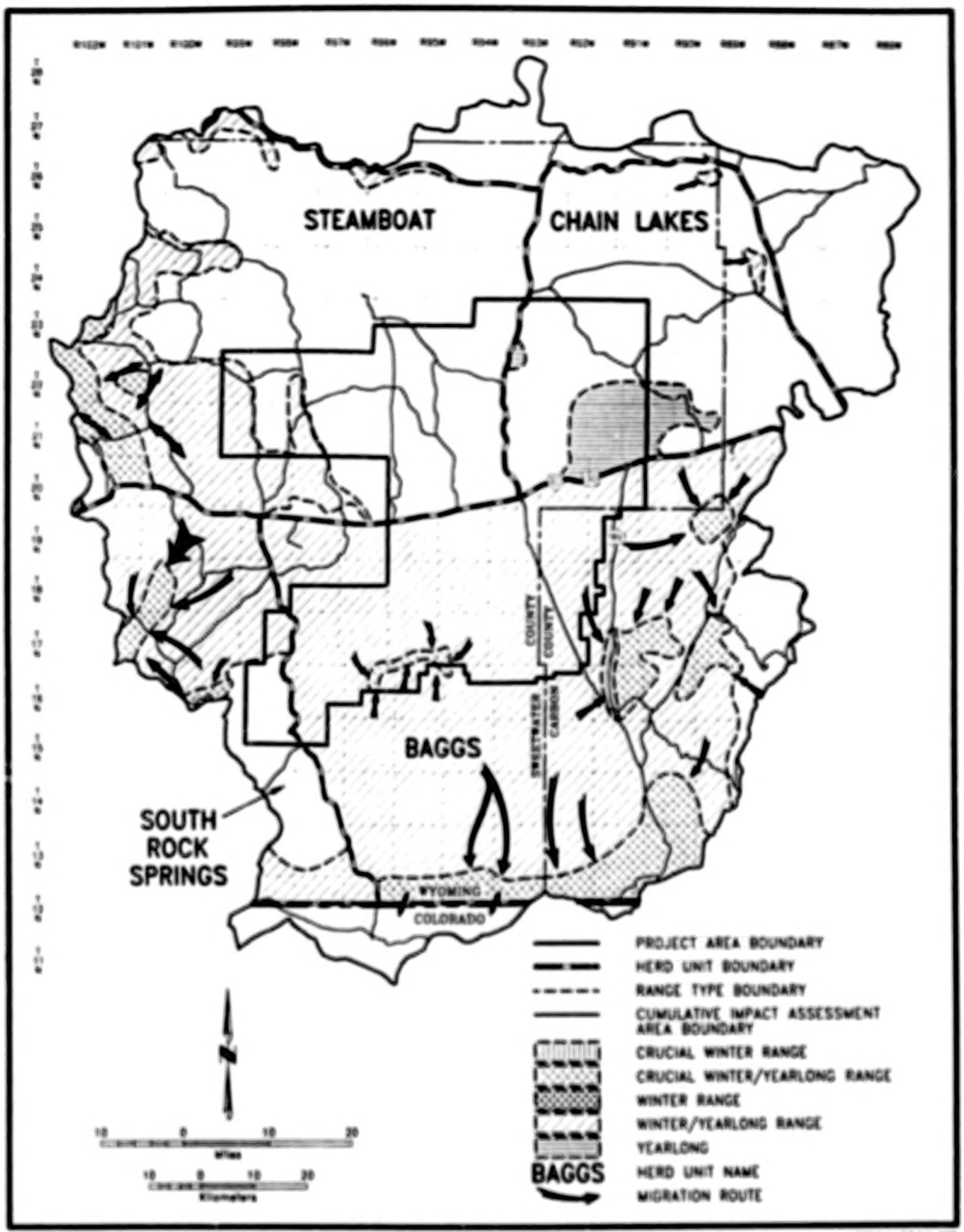
Species/Herd/Range	Total Acreage	Project-Required Surface Disturbance[2] Initial	Project-Required Surface Disturbance[2] LOP	Existing Disturbance GCIAA[1]	Potential Future Disturbance GCIAA	Total Disturbance Acres[3]	Total Disturbance Percent[4]
Pronghorn							
Red Desert Herd							
Crucial winter/yearlong	272,704	1,032	534	11,900	1,800	14,234	5.2
Winter/yearlong	1,849,024	16,306	8,437	12,400	2,800	23,637	1.3
Bitter Creek Herd							
Crucial winter/yearlong	194,304	34	18	1,550	–	1,568	0.8
Winter/yearlong	1,644,800	15,583	8,003	8,900	2,100	39,063	2.4
Baggs Herd							
Winter/yearlong	303,616	275	143	5,200	600	5,943	2.0
Mule Deer							
Baggs Herd							
Crucial winter/yearlong	255,552	378	196	2,500	300	2,996	1.2
Winter/yearlong	1,438,528	14,138	7,316	19,700	7,800	34,816	2.4
Steamboat Herd							
Winter/yearlong	642,668	1,376	712	5,000	3,600	8,600	1.3
South Rock Springs Herd							
Winter/yearlong	785,856	344	178	14,500	3,400	8,078	1.0
Elk							
Steamboat Herd							
Crucial winter/yearlong	276,544	585	303	300	100	703	0.3
Winter and winter/yearlong	438,656	1,892	979	2,700	2,000	5,679	1.3

[1] Includes existing disturbance required for the proposed project.

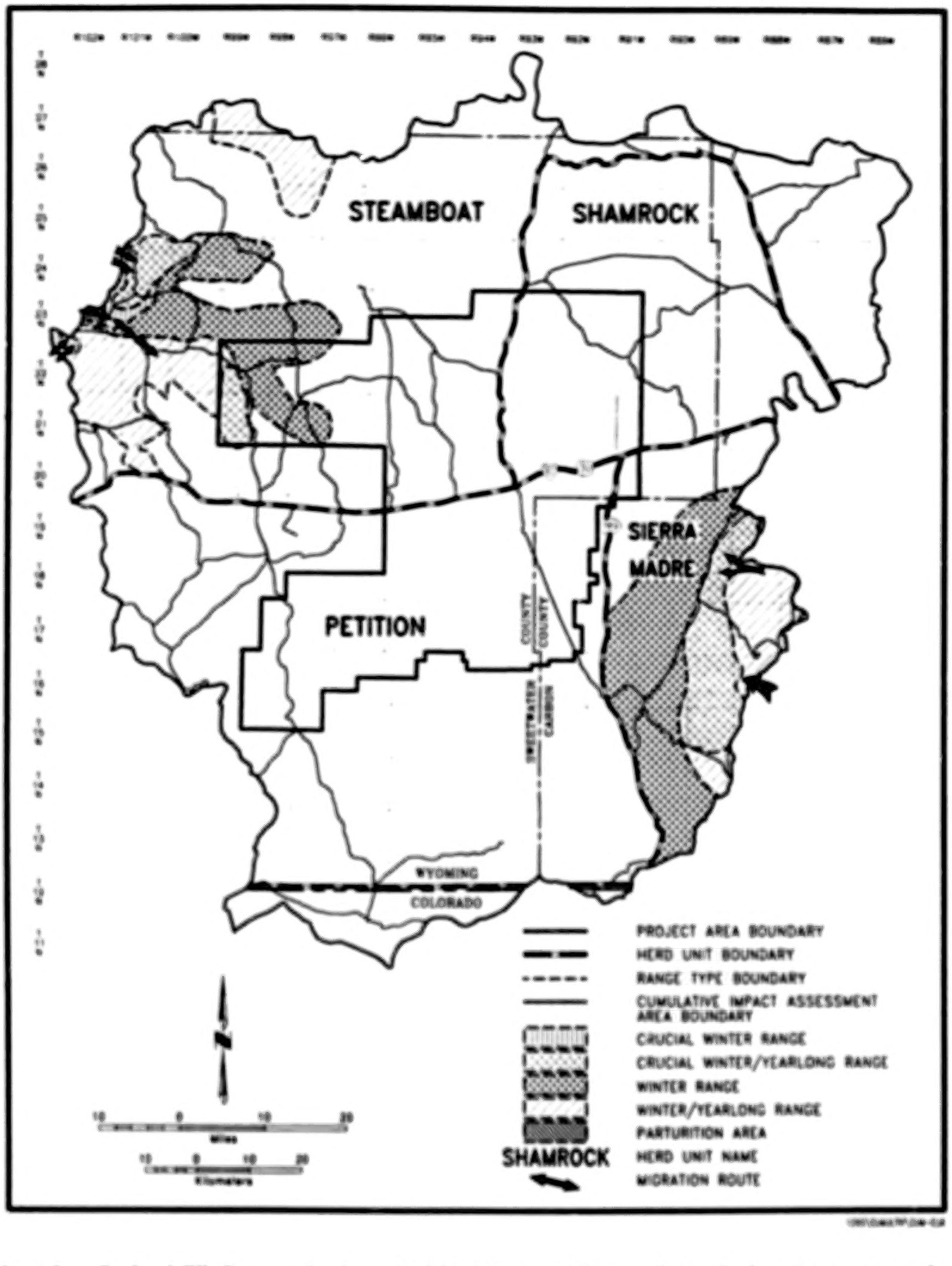
[2] Excludes existing disturbance included as project-required.

[3] Includes all project-required (LOP), existing, and potential future disturbance for each range type for the entire herd.

[4] The percent of the entire range type for the herd affected by direct project-required (LOP), existing, and potential future surface disturbance within the GCIAA.



Map 4.4 Regional Mule Deer Ranges, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.



Map 4.5 Regional Elk Ranges, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Increased access to big game ranges may increase legal and illegal harvest by providing additional opportunities for humans to come into contact with animals. Some individuals may be deterred from poaching because of the greater access and likelihood of being observed by other area users. Law enforcement activities may need to be increased within the CD/WIIPA to deter illegal harvesting of big game. The Proposed Action is expected to have insignificant impacts during the LOP on the ability of the WGFD to achieve population objectives for big game populations on the CD/WIIPA.

While nongame and small mammals would be negatively affected by increased human activity on the CD/WIIPA, primary effects would occur in direct proportion to the amount of a species' habitat removed. Since total initial and LOP surface disturbance (including existing project-required areas) represents only 3.2% and 1.5% of the CD/WIIPA, respectively, and rare habitats (e.g., wetlands) would be avoided where possible, impacts on these populations are expected to be insignificant for all species. A slight increase in mortality from increased traffic in the CD/WIIPA is expected, but these impacts are anticipated to be insignificant.

Indirect Impacts to Big Game. Human disturbance of big game, whether it is intentional (e.g., harassment) or unintentional (i.e., accidental), results in increased energy costs to the alerted animal (Bromley 1985). The disturbed game animal incurs a physiological cost either through excitement (preparation for exertion) or locomotion. A fleeing or displaced animal incurs additional costs through loss of food intake and potential displacement to poorer (lower) quality habitat. If the disturbance becomes chronic or continuous, these costs can result in reduced animal fitness and reproductive potential (Geist 1978). Indirect impacts to all three big game species affected by the Proposed Action may be significant during project construction and for the LOP; however, LOP impacts to big game from displacement and indirect habitat loss are anticipated to be less than those occurring during construction.

Altmann (1958) defined "flight distance" (or displacement distance) as that to which a person can approach a wild animal without causing it to flee. Factors that influence displacement distance in big game include:

- inherent species-specific characteristics;
- the seasonally changing threshold of sensitivity due to reproductive and nutritional status;
- the type of habitat (e.g., longer disturbance distances in open habitats);
- the specific experience of the individual or group (e.g., extent and type of exposure to humans/habituation);
- weather (adverse weather [wind, fog, etc.] may decrease the disturbance distance);
- time of day (e.g., animals generally more tolerant during dawn and dusk periods); and
- the social structure of the animals of interest (a group of individuals is generally more tolerant than solitary individuals).

Several studies have been conducted over the past 25 years in an effort to determine the extent to which human activities influence big game. Many of these studies focus on the potential impacts to big game from oil and gas exploration and production, surface mining, road development, and recreation. In some cases, researchers attempted to determine the distance at which these activities resulted in disturbance to big game. This research is summarized below in order to provide a measure of potential displacement for elk, mule deer, and pronghorn resulting from proposed activities within the CD/WIIPA. Pertinent literature was obtained through computer database searches (i.e., the CARL system and Fish and Wildlife Review on CD-ROM at the University of Wyoming) and a Wyoming Game and Fish Department literature review of impacts to big game (WGFD 1994). The range of displacement distances for big game due to human activities that are comparable to those potentially occurring within the CD/WIIPA (oil and gas exploration and production, road use, and human presence) were determined from this literature. This information was then used to estimate an average distance at which all or a majority of the animals of a particular species would remain undisturbed during well construction and road use on the CD/WIIPA (Table 4.11). This average distance does not represent an absolute or definitive value, but rather a measure of the anticipated displacement of big game from areas adjacent to such activities. In some cases, topographic or habitat features may provide protection from the visual disturbance and noise associated with these activities and allow animals to remain undisturbed inside of the average displacement

Table 4.11 Potential Displacement Distances for Big Game Species, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Big Game Species	Type of Disturbance	Potential Displacement Distance (miles)	Supporting Literature
Pronghorn	Well construction/ workovers	0.5	Gusey (1986); Easterly et al. (1991).
	Road traffic/operations and maintenance	0.25	Bruns (1977); Autenrieth (1983); Reeve (1984); Yeo et al. (1984).
Mule deer	Well construction/ workovers	1.0	Hiatt and Baker (1981); Gusey (1986).
	Road traffic/operations and maintenance	0.75	Perry and Overly (1976); Freddy (1986); Freddy et al. (1986); O'Neil and Witmer (1991).
Elk	Well construction/ workovers	1.5	Hiatt and Baker (1981); Gusey (1986); Brekke (1988).
	Road traffic/operations and maintenance	1.0	Ward (1973, 1976); Ward et al. (1973); Perry and Overly (1976); Rost and Bailey (1979); Ryder et al. (1986); O'Neil and Witmer (1991).

distance. Additionally, as big game animals in the CD/WIIPA become acclimated to traffic and other routine project activities, displacement distances would likely be reduced.

In general, of the three big game species that occur within the CD/WIIPA, it appears that pronghorn exhibit the least amount of displacement due to oil and gas development activities. Although some level of habitat displacement was noted in pronghorn populations adjacent to oil and gas developments in Wyoming, New Mexico, and Texas (Gusey 1986; Guenzel 1987; Easterly et al. 1991), pronghorn returned to these habitats once the source of the disturbance (i.e., construction crews, vehicles) left the area (Easterly et al. 1991). Segerstrom (1982) and Deblinger (1988) determined that a large proportion of the pronghorn populations inhabiting surface mine sites in Wyoming were relatively unaffected by mining activities and habituated to the presence of personnel and vehicles.

Easterly et al. (1991) noted that pronghorn in the Rattlesnake Hills area of Wyoming avoided areas within 0.6 mi of drilling or well maintenance operations. Pronghorn in New Mexico and Texas tended to avoid areas within 0.5 mi of such activities (Gusey 1986). It is anticipated that pronghorn in the CD/WIIPA could remain approximately 0.5 mi from well sites during development and maintenance (workover) operations (Table 4.11).

Pronghorn in southeastern Alberta and northern Montana generally remained at least 0.3 mi from a highway (Bruns 1977). At a wind turbine site near Medicine Bow, Wyoming, pronghorn habituated to construction and maintenance traffic and did not abandon habitats adjacent to roads (Reeve 1984; Yeo et al. 1984). Autenrieth (1983) recommended that a buffer of 0.25 mi be placed around critical habitats for pronghorn to minimize disturbance to these key areas. Pronghorn within the CD/WIIPA would probably be displaced approximately 0.25 mi from traffic on roads

(Table 4.11), but this displacement would likely decrease as pronghorn habituate to traffic in the area.

Mule deer are generally less sensitive to human disturbance than elk and, in some cases, may be less sensitive than pronghorn (Easterly et al. 1991). In the Rattlesnake Hills of Wyoming, mule deer did not avoid oil fields and may have habituated to human activity associated with petroleum exploration and production (Easterly et al. 1991). Wintering mule deer in Montana were minimally affected by low levels of oil and gas development (Irby et al. 1988). On the other hand, mule deer on Crooks Mountain in Wyoming were not observed within 0.5 mi of a well construction site (Hiatt and Baker 1981).

Gusey (1986) reported that mule deer in New Mexico, Oklahoma, and Texas were displaced up to 1 mi from active well sites. The same was also true for mule deer on Crooks Mountain in Wyoming (Hiatt and Baker 1981). Based on this information, it is anticipated mule deer within the CD/WIIPA could be displaced approximately 1 mi from well construction sites during development (Table 4.11).

Mule deer in a forested situation in the Blue Mountains of Washington avoided areas within 0.5 mi of main and secondary roads (Perry and Overly 1976). In the Salmon River Basin of Idaho, on the other hand, disturbance to mule deer from traffic was believed to exceed 1 mi in areas of less than 20% forest cover (O'Neil and Witmer 1991). Studies in sagebrush habitats of northern Colorado indicated that wintering mule deer were displaced 0.3 mi by persons on foot or riding snowmobiles (Freddy 1986; Freddy et al. 1986). Based on this information, it is likely that mule deer within the CD/WIIPA could be displaced an average of 0.75 mi from traffic on roads (Table 4.11). Of the three species of big game occurring within the CD/WIIPA, elk are probably the most sensitive to human disturbance. Although they may habituate to human presence on a localized basis (Adams 1982; Gusey 1986; Cassirer et al. 1992; Morrison et al. 1995), elk usually move from areas adjacent to human activity and remain away until the activity has ceased for a period of time (Bennington et al. 1982; Hayden-Wing Associates 1990a, 1990b).

Displacement of elk due to oil and gas development activities ranged from a low of 0.25 mi in Michigan (Bennington et al. 1982) to 2.4 mi in western Wyoming (Hayden-Wing Associates 1990b; Johnson et al. 1990). Displacement of elk due to well construction ranged from 0.75 mi in southern Colorado (Brekke 1988) to 2.0 mi in central Wyoming (Hiatt and Baker 1981). Gusey (1986) noted that wildlife managers in New Mexico recorded elk movements of up to 1.5 mi from well construction sites. Based on this information, it is anticipated that elk on the CD/WIIPA could be displaced an average of 1.5 mi from well locations during construction, drilling, completion, and workover operations (Table 4.11).

Elk tend to react less to traffic along roads than to concentrated areas of noise and activity such as well sites. In forested habitats, displacement of elk due to traffic along roads ranged from 0.125 mi (Rost and Bailey 1979) to 0.5 mi (Ward 1973, 1976; Ward et al. 1973; Perry and Overly 1976). Few studies have been conducted on the effect of roads on elk in relatively open habitats such as those occurring in the CD/WIIPA. Ryder et al. (1986) determined that elk within the Steamboat Mountain herd, which is the same herd that occurs within the CD/WIIPA, that were located greater than 0.62 mi from a road generally did not respond to traffic. Elk in the Salmon River Basin of Idaho were displaced up to 1 mi from new roads in situations where the forest cover was less than 20% (O'Neil and Witmer 1991). It is anticipated that elk within the CD/WIIPA could be displaced approximately 1 mi from traffic on roads (Table 4.11).

Alternative A. Under Alternative A, the total amount of initial disturbance within big game ranges on the CD/WIIPA could be the same as that of the Proposed Action. However, LOP surface disturbance on federal lands would likely be reduced within SRAs, which include crucial big game winter ranges (see Table 2.2 and Map 2.3). It is anticipated that impacts (both direct and indirect) would be reduced during construction and for the LOP under this alternative. Some increase in direct and indirect impacts to big game species on private lands could occur under implementation of Alternative A.

Direct and indirect impacts to nongame and small mammals under Alternative A are anticipated to be the same as those of the Proposed Action (i.e., insignificant).

Alternative B. The total amount of direct surface disturbance within big game ranges under Alternative B could be the same as that of the Proposed Action. However, surface disturbance on federal lands in crucial big game winter ranges would be reduced from that occurring under the Proposed Action and increased from that occurring under Alternative A (see Table 2.2). It is anticipated that impacts (both direct and indirect) to big game species would be reduced from those of the Proposed Action during construction and for the LOP under this alternative. Some increase in direct and indirect impacts to big game species on private lands could occur under implementation of this alternative.

Direct and indirect impacts to nongame and small mammals under Alternative B are anticipated to be the same as those of the Proposed Action and Alternative A (i.e., insignificant).

No Action. No impacts beyond those currently allowed under existing CD/WIIPA management policies would occur to big game and other mammal populations under the No Action Alternative. However, impacts to big game and other mammals under this alternative could be increased from those of the Proposed Action and Alternatives A and B due to the absence of coordinated reclamation, transportation, and wildlife protection planning efforts (see Appendices A, B, and D). Maximum estimated new long-term surface disturbance (2,400 acres) to big game crucial winter ranges on the CD/WIIPA under the No Action Alternative would be 72 acres for the Red Desert pronghorn herd, 27 acres for the Baggs mule deer herd, and 41 acres for the Steamboat elk herd, and less than 5 acres for the Bitter Creek pronghorn herd. In the absence of further CD/WIIPA developments, no additional impacts to big game and other mammals would occur.

Mitigation and Monitoring

Applicant-Committed Measures

- Operators would support and implement activities as defined in the Wildlife Protection Plan for this project (see Appendix D).
- Operators would not perform construction activities in big game crucial winter ranges from November 15 to April 30, unless specifically allowed by the BLM.
- Wildlife-proof fencing would be constructed around areas potentially hazardous to wildlife (e.g., reserve pits, toxic material storage locations) as deemed necessary by the BLM.
- Wildlife-proof fencing would be utilized on reclaimed areas if it is determined that wildlife species are impeding successful vegetation establishment.
- Reserve, workover, and evaporation/production pits potentially hazardous to wildlife would be adequately protected (e.g., fenced, netted) to prohibit wildlife access as directed by the BLM and to ensure protection of migratory birds and other wildlife.
- ROW fencing associated with this project would be kept to a minimum, and if necessary, fences would meet BLM and WGFD approval for facilitating wildlife movement.
- Operators would implement policies designed to control poaching and littering and would notify all employees (contract and company) that conviction of a major game violation could result in disciplinary action. Contractors would be informed that any intentional poaching or littering within the CD/WIIPA could result in dismissal.
- Operators would internally enforce existing drug, alcohol, and firearms policies.

Additional Potential BLM-Required Mitigation

BLM budget constraints limit the agency's ability to implement significant additional wildlife mitigation and monitoring efforts. However, with the application of the Operator-committed Wildlife Protection Plan (see Appendix D), limited additional efforts would be necessary. The BLM may, however, require the application of the scientific method to various components of the Wildlife Protection Plan to assist in identifying cause and effect relationships were wildlife populations appear to be declining in the CD/WIIPA.

Under Alternatives A and B, workovers, perforation, and fracturing operations may not be permitted on big game crucial winter ranges from November 15 to April 30, unless it can be shown that big game animals would not be adversely affected by such actions.

Within crucial ranges, construction, drilling, workovers, and production facility installation activities may require advanced scheduling for the period of May 1 through November 14 to prevent disturbance of wintering animals. Exceptions which allow these activities on crucial winter ranges during critical winter periods may be granted by the Authorized Officer in consultation with the WGFD if mild winter conditions prevail and ample foraging habitat remains for big game on adjacent areas. Typically, when a drilling operation begins, it is allowed to be completed. Decision points for shutdown occur between pad construction and drilling and between drilling and well production facilities installation.

The BLM may encourage Operators to implement an employee education program regarding WGFD rules and regulations for the area. Further, Operator personnel may be encouraged to support WGFD surveillance in the area by immediately reporting all observed illegal harvesting of wildlife or other mortality of important wildlife on the CD/WIIPA.

During the winter, the BLM may require Operators to provide escape openings along access roads in big game crucial ranges as designated by the BLM and WGFD to facilitate exit of big game animals from snowplowed roads. Some roads on the CD/WIIPA may be closed (i.e., gated and locked) to deny unnecessary access during critical winter periods. To minimize displacement and stress of animals, the Operators may be required to instruct workers and contractors to avoid stopping and exiting their vehicles in big game winter habitat while there is snow on the ground. Such activities have been observed to be far more disturbing than moving vehicles or construction activity (Parker et al. 1984; Kuck et al. 1985; Czech 1991; Cassirer et al. 1992; Morrison et al. 1995).

To protect important habitat in southwestern portions of the CD/WIIPA (i.e., ephemeral draws dominated by basin big sagebrush) construction activities in areas with sagebrush greater than 3 ft tall may be restricted. Additional on-lease mitigation measures within crucial winter ranges, including various habitat improvement practices, may be negotiated by the BLM to compensate for unavoidable loss of crucial winter range.

All reserve, evaporation, and flare pits may require fencing to prevent wildlife access, and all pits may require netting (l-inch mesh) as deemed necessary by the BLM. If nongame, small mammals, and other wildlife are attracted to and use any of the reserve pits or other localities that contain potentially harmful substances, appropriate measures to restrict access (e.g., fencing, netting, pool covers) may be required to assure that impacts to wildlife are minimized.

Firearms and dogs may not be allowed on-site during working hours.

To minimize wildlife mortality due to vehicle collisions, Operators may be required to advise project personnel regarding appropriate speed limits on the CD/WIIPA, and roads may require reclamation as soon as possible after they are no longer required. Some existing roads on the CD/WIIPA may be closed and reclaimed as deemed appropriate by the BLM. In addition, project-required travel may be restricted to only that necessary for efficient project operation on roads located in big game crucial ranges during critical winter months. Potential increases in poaching may be minimized through employee and contractor education regarding wildlife laws. If violations are discovered, the offending employee or contractor may be disciplined and dismissed.

Additional site-specific wildlife/fisheries mitigation measures may be stipulated in approved APDs and ROW applications or provided in annual reviews of the wildlife data provided by the implementation of the Wildlife Protection Plan (see Appendix D). Additionally, the BLM may require a Cooperative Agreement between Operators, BLM, WGFD, and USFWS for the implementation of the Wildlife Protection Plan.

Operators may also be required to monitor project activity in big game crucial ranges during critical periods to ensure that no unauthorized use occurs and to ensure that authorized activities in these areas are conducted in the most efficient manner possible to limit potential adverse impacts. Any big game, raptor, or other important wildlife injury or mortality on the CD/WIIPA noted by the Operators may be required to be reported to the BLM and/or WGFD as soon as practical.

Cumulative Impacts. Cumulative impacts resulting from direct habitat loss for all big game herds are unknown; however, monitoring as identified in

Appendix D would allow the BLM to determine if further studies are required (i.e., cause-and-effect studies) and whether additional mitigations are necessary. Impacts to the Red Desert pronghorn herd under the Proposed Action, indicate that approximately 5.2% (14,234 acres) of the crucial winter/yearlong range for the herd would be directly impacted by existing, proposed, and potential future surface disturbance (Table 4.10), and this impact is anticipated to be significant. Cumulative impacts to this herd under either Alternative A or Alternative B would likely be reduced due to surface disturbance limitations and anticipated reductions in associated displacement. Direct disturbance of crucial winter and other winter ranges for all affected herds is given in Table 4.10. Cumulative indirect disturbance (e.g., displacement) would likely be as discussed for the Proposed Action (i.e., potentially significant).

Since no long-term large-scale fencing would be utilized by this project, impacts to big game migrations are not anticipated to be significant. However, increased use of the CD/WIIPA and adjacent areas would likely impede big game migrations to some degree due to displacement.

Approximately 2.2% (23,100 acres) of nongame and small mammal habitats would be disturbed as a result of existing and proposed development on the CD/WIIPA (Table 4.2). No additional development beyond that of the Proposed Action is anticipated for the CD/WIIPA. Cumulative impacts to these mammals are anticipated to be insignificant.

4.2.3.2 Birds

Proposed Action. The principal threat to raptors from project activities and associated increased human access is disturbance during nesting resulting in nest abandonment and associated reductions in reproduction success. Potential conflicts between active nest sites and project-related activities would be resolved by the BLM, in consultation with the USFWS and WGFD, to ensure that impacts to raptors or their nesting success would be minimized. Past NEPA documents have indicated that with the implementation of raptor nest avoidance mitigations as contained in lease stipulations (see Section 2.6.13.9, Item 11), impacts to raptors from oil and gas development activities would be insignificant. However, the USFWS and others have indicated that seasonal construction stipulations may be inadequate to protect some raptor species since disturbance due to the presence of humans during well operation and maintenance activities could occur within raptor nest buffers in future years when nests are or potentially could be active. If this disturbance resulted in nest abandonment and/or reproductive failure, significant impacts to raptors would result.

Factors potentially resulting in decreased raptor reproductive success from the presence of increased human activities in the area include nest and/or area abandonment, damage to eggs or young from frightened adults, overexposure of eggs or young to heat or cold, missed feedings, premature fledging, and increased predation. The potential for these impacts would be greatest during project development (10-15 years), when human activity levels are greatest; the potential for these types of impacts would be reduced during LOP.

While the spatial and temporal buffer zones proposed by Operators (see Section 2.6.13.9) would provide seasonal protection of raptor nests from human activities, nothing would prevent development within the buffer zone outside of the nesting season, and activities associated with this development (e.g., well maintenance actions, traffic) could disturb nesting raptors during subsequent nesting seasons. For this reason, buffer zones around active raptor nests during nesting periods may provide inadequate nest protection and result in reproductive failure in some raptor nesting territories. Unoccupied suitable raptor nesting habitat also would be unprotected, and as the area becomes fragmented by project facilities, the availability of alternate nest sites may become limited.

Tolerance to disturbance varies between raptor species and among individuals of the same species, and raptor nest disturbance and the associated decrease in reproductive success may not occur at all if project facilities are located outside of the line-of-sight of active raptor nests and/or other raptor protection measures are effective.

A total of 549 well locations could be developed within known suitable raptor nesting buffers (i.e., the 194,400 acres within 1.0 mi of known active raptor nests and the SRAs delineated for raptors [see Map 3.12]) on the CD/WIIPA resulting in an initial and LOP direct surface disturbance of 6,300 acres

(3.2%) and 3,300 acres (1.7%), respectively, in suitable nesting buffers (Table 4.12). Specific nest activity status would be identified during surveys implemented for APD and ROW application processing.

Raptors, primarily golden eagles and ferruginous hawks, occasionally construct nests on well site facilities in Wyoming (BLM 1994a). In the event raptors nest on production/operation facilities, artificial nesting structures would be provided as directed by the BLM in consultation with the USFWS. Artificial nesting structures have been successfully used by eagles and ferruginous hawks in the region (Call and Tigner 1991). Operators would cooperate in appropriately locating and constructing artificial nesting structures.

Reduction in raptor prey species is not anticipated to be a major concern since disturbance (33,600 acres initially and 15,900 acres for the LOP) would be scattered throughout the CD/WIIPA (i.e., multiple raptor foraging territories), and surface disturbance would be minimized. The entire CD/WIIPA is considered suitable for raptor foraging. Therefore, the reduction in prey species would occur over a relatively large number of potential raptor territories, limiting prey reduction in any one territory to insignificant levels.

Nine hundred sixty-three of the 3,000 proposed wells would occur in probable sage grouse nesting habitat (i.e., the 340,200 acres within 2.0 mi of sage grouse leks) on and immediately adjacent to the CD/WIIPA (Table 4.12). This would result in an initial disturbance of 11,000 acres (3.2%) and a LOP disturbance of 5,700 acres (1.7%) of this habitat within the CD/WIIPA (Table 4.12). Disturbance of nesting habitat would be distributed among five UGBMAs with the majority occurring in the Red Desert (2,600 acres LOP surface disturbance) and the south Wamsutter UGBMAs (1,800 acres LOP surface disturbance). No well locations would be situated within the 7,000 acres of potential breeding habitat on the CD/WIIPA (see Tables 3.14 and 4.12). The BLM would require that surface disturbance within 0.25 mi of an existing sage grouse lek center be avoided. Linear disturbances (e.g., pipelines, seismic activity) may be granted exceptions. Leks located immediately adjacent to existing roads could experience some disturbance from increased traffic due to project activity. With the implementation of the Wildlife Protection Plan for this project and associated monitoring and potential implementation of augmented protection measures (see Appendix D), impacts to sage grouse associated with the Proposed Action are expected to not be significant.

While the BLM believes that existing oil and gas lease stipulations (see Section 2.6.13.9, Items 12 and 13) adequately protect strutting and nesting sage grouse, no data are available on the adequacy of these measures for sage grouse protection. Regional sage grouse populations have apparently been decreasing over the last several years, and these decreases have been attributed to a number of factors including climate, predation, livestock grazing, and mineral development.

While nongame birds would be negatively affected by increased human activity on the CD/WIIPA, primary effects would occur in direct proportion to the amount of a species' habitat removed. Since total initial surface disturbance (33,600 acres) (see Table 2.1) represents only 3.2% of the CD/WIIPA and rare habitats (e.g., wetlands) would be avoided where possible, impacts to these populations are expected to not be significant for most species and less significant for all species. LOP habitat loss for nongame birds would decrease to 1.5% (15,900 acres). A slight increase in mortality from increased traffic is expected, but this would also be insignificant. If birds (e.g., wading/shorebirds and waterfowl) are attracted to and use any of the reserve pits or other potentially hazardous localities, appropriate measures to restrict access (e.g., netting, pool covers) would be employed to assure that impacts to birds are minimized and remain insignificant for the LOP.

Alternative A. Impacts to sage grouse and other birds under Alternative A would be similar to those identified for the Proposed Action (Table 4.12). However, impacts to raptors would likely be reduced under this alternative due to reduced surface disturbance and associated human activity levels on federal lands in SRAs which include raptor nesting concentration areas (see Maps 2.3 and 3.12 and Table 2.2). Some increased impacts to raptors and other bird species may occur on private lands under Alternative A, but the overall impact is expected to not be significant.

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Table 4.12 Acreage of Direct Surface Disturbance in Regional Raptor and Sage Grouse Habitats, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

		Project-Required Surface Disturbance[1]		Cumulative Disturbance		Cumulative Disturbance Total	
Species/Habitat	**Approximate Total Acreage**	**Initial**	**LOP**	**Existing Disturbance[2]**	**Potential Future Disturbance**	**Acres[3]**	**Percentage[4]**
Raptors							
Potential Foraging	2,286,000	33,660	15,900	56,600	9,000	81,500	3.6
Suitable Nesting Buffer	2,063,000	6,300	3,300	19,640	8,000	30,940	1.5
Sage Grouse[5]							
Red Desert UGBMA							
Probable nesting	571,000	4,800	2,600	10,900	2,000	15,500	2.7
Potential breeding	31,000	0	0	1,300	0	1,300	4.2
South Wamsutter UGBMA							
Potential nesting	265,500	3,100	1,800	4,100	1,100	7,000	2.6
Potential breeding	17,200	0	0	500	0	500	2.9
Flaming Gorge UGBMA							
Probable nesting	72,400	1,300	600	1,500	600	2,700	3.7
Potential breeding	5,600	0	0	200	0	200	3.6
Eden UGBMA							
Probable nesting	171,400	1,000	400	1,300	700	2,400	1.4
Potential breeding	8,100	0	0	200	0	200	2.5
Sierra Madre GBMA							
Probable nesting	386,200	800	300	3,600	500	4,400	1.1
Potential breeding	29,300	0	0	400	0	400	1.4
Total probable nesting	1,466,500	11,000	5,700	21,400	4,900	32,000	2.2
Total potential breeding	91,200	0	0	2,700	0	2,700	3.0

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[1] Includes existing disturbance required for the Proposed Project.

[2] Excludes existing disturbance identified as project-required.

[3] Includes all project-required (LOP), existing, and potential future surface disturbance for each habitat category within the MCIAA and 1-mi buffer for raptors or the entire UGBMA within the GCIAA for sage grouse.

[4] The percent of each habitat category affected by direct project-required (LOP), existing, and potential future surface disturbance within relevant cumulative impact assessment areas (see footnote 3).

[5] Construction activities would be excluded within 0.25 mi of sage grouse lek centers for this and other regional projects.

Alternative B. Impacts to sage grouse and other birds under Alternative B would be similar to from those identified for the Proposed Action (Table 4.12). However, impacts to raptors would likely be reduced from those of the Proposed Action and increased from those of Alternative A under this alternative. Some increased impacts to raptors and other bird species may occur on private lands under Alternative B. Impacts to raptors under Alternative B would likely be increased somewhat from those of Alternative A, but would remain insignificant.

No Action. No impacts to raptors, sage grouse, and other bird populations above allowable levels would occur under the No Action Alternative. However, impacts to avian resources under this alternative could be increased from those of the Proposed Action and Alternatives A and B due to the absence of coordinated reclamation, transportation, and wildlife protection planning efforts (see Appendices A, B, and D). Approximately 6,400 acres of new disturbance is expected to occur in the CD/WIIPA and new long-term disturbance is anticipated to be 2,400 acres. Total anticipated long-term disturbance (including all existing disturbance) is expected to be 17,200 acres of which approximately 1,700 acres would be in active raptor nesting buffers, 3,300 acres would be in all raptor nest buffers, and 2,900 acres would be in probable sage grouse nesting habitat. In the absence of further CD/WIIPA development, no additional impacts to raptors, sage grouse, and other birds would occur.

Mitigation and Monitoring

Applicant-Committed Measures

- Operators would support and implement activities as defined in the Wildlife Protection Plan for this project (see Appendix D).
- Reserve, workover, and evaporation/production pits potentially hazardous to wildlife would be adequately protected (e.g., fenced, netted) to prohibit wildlife access as directed by the BLM and to ensure protection of migratory birds and other wildlife.
- Any power line construction would follow recommendations by APLIC (1994, 1996) and Ollendorf et al. (1981) to avoid collisions and electrocution of raptors and other avifauna.
- USFWS and WGFD consultation and coordination would be conducted as necessary for all mitigation activities related to raptors, and T&E species (and their habitats) and all permits required for movement, removal, and/or establishment of raptor nests would be obtained.
- Proposed disturbance within 1.0 mi of identified raptor nests would be surveyed by a qualified biologist to determine activity status prior to commencement of drilling and construction during raptor nesting periods. If an active raptor nest is identified within 0.25 to 1.0 mi (depending upon species and line of sight) of a proposed site, the Operators would restrict construction during the critical nesting season for that species.
- Operators would not conduct surface-disturbing activities within 0.25 mi of active sage grouse leks.
- Operators would limit construction activities between March 1 and June 30 within a 2.0-mi radius of active sage grouse leks on suitable sage grouse nesting habitat as determined during on-site reviews of proposed development areas.

Additional Potential BLM-Required Mitigation

The BLM may require Operators to implement an employee education program regarding WGFD rules and regulations for the area. Furthermore, project personnel may be required to support WGFD surveillance in the area by immediately reporting all observed illegal harvesting of wildlife or other mortality of important wildlife on the CD/WIIPA.

All reserve, evaporation, and flare pits may require fencing to prevent wildlife access, and all pits may require netting (1-inch mesh) as deemed necessary by the BLM. If nongame species, small mammals, and other wildlife are attracted to and use any of the reserve pits or other localities that contain potentially harmful substances, appropriate measures to restrict access (e.g., fencing, netting, pool covers) may be required to assure that impacts to wildlife are minimized.

All reserve pits would be backfilled when dry, and for pits identified as containing oil or other potentially toxic substances, pit restoration would begin immediately (i.e., within 15 days) after cessation of drilling and testing activities, or pits would be netted. Reserve pit netting and other access restriction measures would be monitored for effectiveness by the BLM, and if proven ineffective, further mitigation measures would be applied. The BLM may also require fencing of the entire producing well location.

Unless otherwise agreed to by the Authorized Officer in writing, power lines would be constructed in accordance with the standards outlined in APLIC (1994, 1996). Operators would assume the burden and expense of proving that pole designs not shown in the above publications are "eagle safe." Such proof would be provided by a raptor expert approved by the BLM Authorized Officer. The BLM reserves the right to require modifications or additions to all power line structures placed on ROWs should they be necessary to ensure the safety of large perching birds. Such modifications and/or additions would be made by the Operators without liability or expense to the BLM.

Well locations, pipelines, and associated roads may be selected and designed to minimize disturbances to areas of high wildlife value (e.g., wetland areas). All production facilities (e.g., compressors) may require muffling such that noise levels would not exceed a maximum of 55 dBA at 500 ft from facilities. Activities or surface disturbance may not be allowed within 0.25 mi or greater distance of sage grouse lek centers (active or inactive) at any time, and all surface disturbance within 0.25 mi would be avoided, where practical. Linear disturbances (e.g., pipelines, seismic activity) may be granted exceptions. To protect probable sage grouse nesting habitat, construction or drilling activities may not be allowed on sage grouse nesting habitats within 2.0 mi of lek centers between March 1 and June 30. Wakkinen et al. (1992) indicate that 92% of sage grouse nests may be protected from disturbance through the application of a 1-mi buffer.

The BLM may require Operators to finance raptor nest searches by qualified biologists to determine the activity status of raptor nests within 1.0 mi of proposed disturbance areas, and data collected during these and previously conducted surveys would be used during APD and ROW application processes to assess potential development impacts to nesting raptors and avoid raptor nesting areas, as necessary. Activities near active raptor nests may be prohibited within a 1.0-mi radius or other distance as necessary to avoid disturbing birds from February 1 through July 31. Mitigation for raptor nests would be designed on a site-specific basis in consultation with the BLM, USFWS, and WGFD. Operators would notify the BLM immediately if raptors are found nesting on project facilities, and Operator employees would assist the BLM as necessary in erecting artificial nesting structures.

Operators, in cooperation with the BLM, may be required to monitor raptor nesting and sage grouse lek use on and adjacent to the CD/WIIPA to ensure that these sensitive resources are protected throughout the LOP.

Cumulative Impacts. The area of cumulative impact assessment for raptors is the MCIAA and a 1-mi buffer, whereas that for sage grouse is all affected UGBMAs in the GCIAA (see Maps 4.6 and 4.7 and Table 4.1). The cumulative impact assessment area for other bird species is the CD/WIIPA and impacts to these species would approximate that described for the Proposed Action (i.e., not significant). Cumulative impacts to potential raptor habitat resulting from regional developments are unknown; however, as with the Proposed Action, if developments result in raptor nest abandonment or reproductive failure, significant impacts could result. Nevertheless, stipulations protecting raptor nests would likely adequately protect these resources on the MCIAA, thereby avoiding undesirable impacts to area-wide raptor populations affected by existing, proposed, and potential future development. The potential for significant cumulative impacts to raptors, sage grouse, and other birds are unknown under implementation of the Proposed Action; however, impacts would be reduced under implementation of Alternatives A or B. With the application of wildlife protection measures identified in the Wildlife Protection Plan (see Appendix D), the BLM would be able to determine if further studies are necessary (i.e., cause-and-effect studies) and whether additional mitigations are required.

Table 4.12 presents total existing, proposed, and potential future surface disturbance in raptor and sage grouse habitats within their respective cumulative impact assessment areas. Approximately 3.6% of all raptor foraging habitat on the MCIAA and an adjacent 1.0-mi buffer would be directly impacted, and 1.5% of all areas within 1.0 mi of known raptor nests

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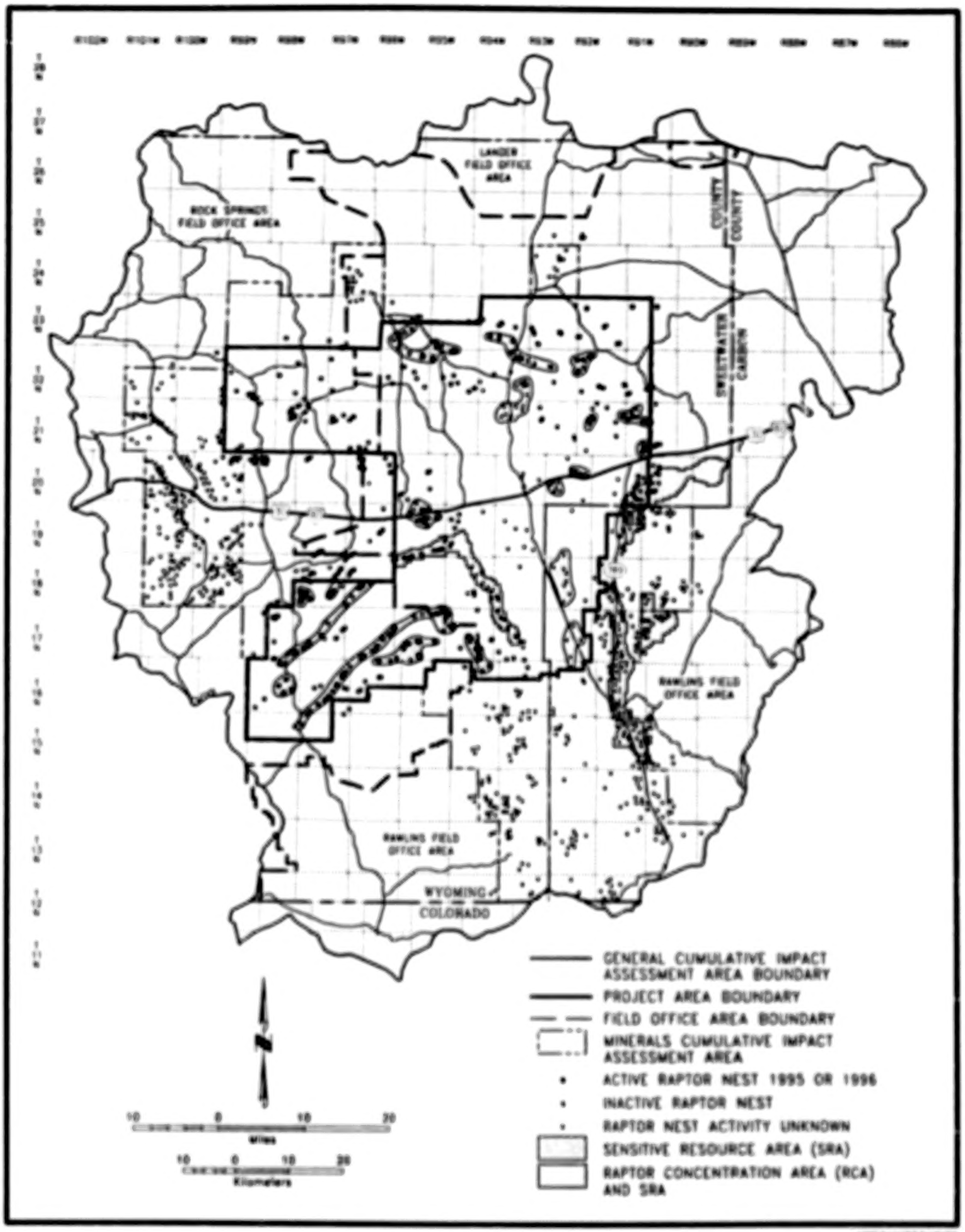
LANDER FIELD OFFICE AREA
ROCK SPRINGS FIELD OFFICE AREA
SWEETWATER COUNTY
CARBON COUNTY
RAWLINS FIELD OFFICE AREA
RAWLINS FIELD OFFICE AREA
WYOMING
COLORADO
GENERAL CUMULATIVE IMPACT ASSESSMENT AREA BOUNDARY
PROJECT AREA BOUNDARY
FIELD OFFICE AREA BOUNDARY
MINERALS CUMULATIVE IMPACT ASSESSMENT AREA
ACTIVE RAPTOR NEST 1995 OR 1996
INACTIVE RAPTOR NEST
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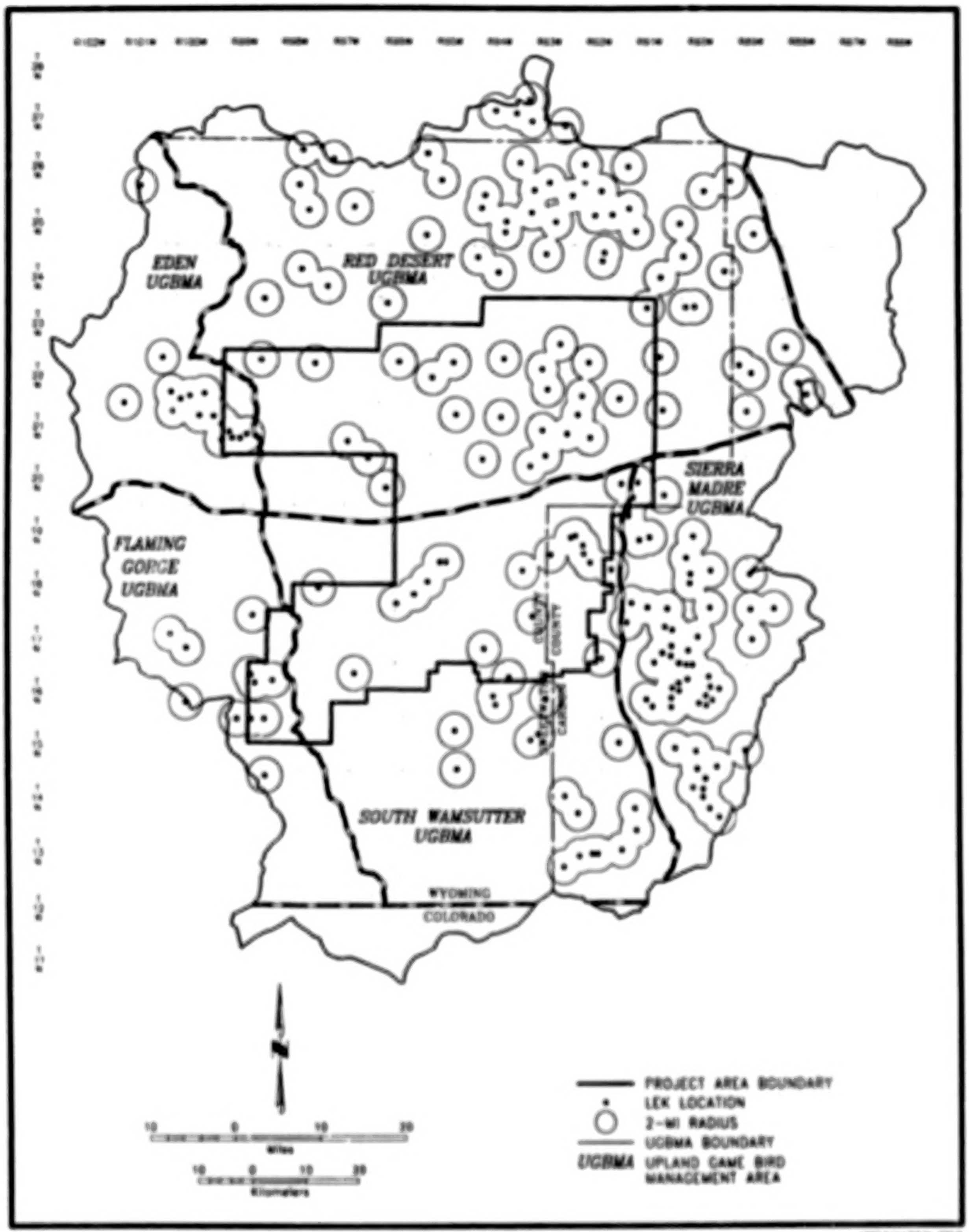
Map 4.6 Regional Raptor Nesting, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.



Map 4.7 Regional Sage Grouse Leks, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

would be disturbed. Additional disturbance associated with displacement due to human activities also would likely occur.

Approximately 2.2% of probable sage grouse nesting habitat within the entire GCIAA would be directly impacted by long-term surface disturbance from the proposed project in combination with existing and potential future developments (Table 4.12). Maximum disturbance would occur in probable nesting areas for the Red Desert, South Wamsutter and Flaming Gorge UGBMAs, with 2.7%, 2.6%, and 3.7% of probable sage grouse nesting habitat for these UGBMAs within the GCIAA being disturbed, respectively. The majority of cumulative surface disturbance (32,000 acres) within probable sage grouse nesting habitat occurs as existing disturbance (21,400 acres, 67%). Additional disturbance associated with displacement due to human activities also would likely occur. No new surface disturbance would occur within potential sage grouse breeding habitat. Stipulations protecting sage grouse leks would protect these resources throughout the GCIAA and minimize additional undesirable impacts to area-wide sage grouse populations.

Approximately 2.4% (106,300 acres) of regional nongame bird habitats would be disturbed as a result of past, present, and reasonably foreseeable developments in the 4,490,000 acres GCIAA (Table 4.2). Overall, cumulative impacts to bird populations within the region are unknown; however, monitoring as identified in Appendix D would allow the BLM to determine if further studies are required (i.e., cause-and-effect studies) and whether additional mitigations are necessary.

4.2.3.3 Amphibians and Reptiles

Proposed Action. While amphibians and reptiles may be negatively affected by increased human activity in the CD/WIIPA, primary effects would occur in direct proportion to the amount of their habitat removed. Impacts to these species would be insignificant since total initial surface disturbance resulting from the Proposed Action represents only 3.2% of the CD/WIIPA and disturbance levels for the LOP would decrease to 1.5% of the area. A slight increase in mortality from increased traffic in the CD/WIIPA is expected but would also not be significant. Project-wide mitigation measures (see Section 2.6.13), including the avoidance of wetland/riparian areas (i.e., crucial amphibian habitat) during project development, would further reduce project impacts to amphibian species.

Alternative A. Impacts to amphibians and reptiles under this alternative would be the same as described for the Proposed Action (i.e., insignificant).

Alternative B. Impacts to amphibians and reptiles under this alternative would be the same as described for the Proposed Action (i.e., insignificant).

No Action. Impacts to amphibian and reptile populations under this alternative would occur at existing allowable levels. However, impacts to amphibians and reptiles under this alternative could be increased from those of the Proposed Action and Alternatives A and B due to the absence of coordinated reclamation, transportation, and wildlife protection planning efforts (see Appendices A, B, and D). Commensurate with existing oil and gas development policy, an estimated 6,400 acres of new disturbance is expected to occur on the CD/WIIPA, and new long-term disturbance is anticipated to be 2,400 acres (see Table 2.1). Total anticipated long-term disturbance on the CD/WIIPA (including existing disturbance) is expected to be 17,200 acres or 1.6% of the area. In the absence of further development, no increased impacts to amphibians and reptiles would occur.

Mitigation and Monitoring. No additional mitigation or monitoring beyond those measures listed for other resources and dealing with minimizing the amount of area disturbed and protection of water resources is proposed specifically for herpetiles.

Cumulative Impacts. Approximately 2.2% of regional amphibian and reptile habitats would be disturbed as a result of past, proposed, and potential future developments in the CD/WIIPA (see Table 4.2). With the application of standard wetland and other habitat protection and reclamation measures, cumulative impacts to amphibian and reptile populations are expected to be insignificant.

4.2.3.4 Fisheries

Proposed Action. Initial construction and drilling activities may degrade water quality due to increased sedimentation and runoff. This potential impact would likely be insignificant with the implementation of proper erosion and sedimentation control mitigations (see Sections 2.6.13.5 and 2.6.13.6) and would remain insignificant throughout the LOP. In addition, the avoidance of wetland/riparian areas would further minimize potential fisheries impacts. No game fish populations are anticipated to be impacted since none are known to occur in the area.

Alternative A. Impacts to fisheries under Alternative A would be as described for the Proposed Action (i.e., insignificant).

Alternative B. Impacts to fisheries under Alternative B, would be as described for the Proposed Action (i.e., insignificant).

No Action. No additional impacts beyond existing allowable levels would occur to fisheries under the No Action Alternative. However, impacts to fisheries under this alternative could be increased from those of the Proposed Action and Alternatives A and B due to the absence of coordinated reclamation, transportation, and wildlife protection planning efforts (see Appendices A, B, and D). In the absence of further development, no increased impacts to fisheries would occur.

Applicant-Committed Measures. No surface water or shallow ground waters in connection with live surface waters would be utilized for the proposed project.

Additional Potential BLM-Required Mitigation. Potential impacts to fisheries may be further minimized by using proper erosion control techniques (see Sections 4.1.6.5, 4.1.7.5, 4.2.1.5, and 4.2.2.5 and Appendix A). Construction within 500 ft of open water and 100 ft of intermittent and ephemeral channels would be restricted, and stream crossings would be authorized only during the period of lowest flow (i.e., late summer and fall).

Cumulative Impacts. Since all regional development projects seek to employ proper erosion control and construction techniques, cumulative impacts to fisheries would likely be insignificant.

4.2.4 Wild Horses

The BLM GDRA and GRRA RMPs (BLM 1990a, 1997a) and state (WSLUC 1979) and local (THK 1977; UW 1991; and Pedersen Planning Consultants 1997, 1998) land use plans address the following management objectives associated with wild horses:

- to protect, maintain, and control viable healthy herds of wild horses while retaining their free-roaming nature;
- to provide for adequate habitat for free-roaming wild horses through management consistent with environmental protection; and
- to provide opportunity for the public to view wild horses.

The following analysis shows that the Proposed Action and alternatives are compatible with these management objectives, and no significant impacts are anticipated.

4.2.4.1 Proposed Action

Loss of forage and intrusion by humans would affect bands of wild horses on the CD/WIIPA. It is anticipated that wild horses would move at least a short distance away from active drilling areas, causing temporary displacement and disruption to wild horse bands in some areas. This would be a short-term impact to individual horses at well locations during construction, drilling, and completion, but not a significant impact to wild horse populations in WHHMAs as a whole.

Wild horses often become accustomed to vehicular traffic and to man at minimal levels and would intermingle in areas where wells are in operation (BLM 1994a). Horses would continue to use the CD/WIIPA when wells are completed and producing. Therefore, operation and maintenance of wells would result in insignificant impacts on wild horses during the LOP.

Approximately 5,600 acres, 5,700 acres, 800 acres, 200 acres, and 800 acres of range within the Salt Wells Creek, Great Divide Basin, Cyclone Rim, Stewart

Creek, and Adobe Town WHHMAs, respectively, would be initially disturbed as a result of the Proposed Action and existing oil and gas activities in the CD/WIIPA. LOP disturbance would be reduced by approximately 52% in each WHHMA. Following initial reclamation and habituation of wild horses to activity in the area, it is anticipated that the Proposed Action would have an insignificant impact on attainment of wild horse population objectives for all affected WHHMAs.

Although vegetation is relatively sparse, range condition is considered to be generally good within the CD/WIIPA. Only a relatively small amount of forage would be lost through initial removal of vegetation, and the temporary conversion of some areas from shrublands to grasslands would likely be beneficial to wild horses; therefore, impacts to wild horses through loss of forage would be insignificant.

Water resources within the CD/WIIPA would not be depleted nor would they be contaminated by the Proposed Action. Some additional water sources suitable for long-term use may be developed by the Proposed Action, resulting in a beneficial impact to wild horses. No significant adverse long-term impacts to wild horses would occur as a result of the Proposed Action. Impacts to wild horse viewing are described in Section 4.5.1.2 (Recreation).

4.2.4.2 Alternative A

Potential impacts to wild horses under Alternative A likely would be the same as described for the Proposed Action.

4.2.4.3 Alternative B

Potential impacts to wild horses under Alternative B likely would be the same as described for the Proposed Action and Alternative A.

4.2.4.4 No Action

No increased impacts beyond existing allowable levels would occur to wild horse populations under the No Action Alternative. However, impacts to wild horses under this alternative could be increased from those of the Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts (see Appendices A and B). Anticipated long-term surface disturbance in the CD/WIIPA in WHHMAs would be 3,000 acres for both the Salt Wells Creek and Great Divide Basin herds, 400 acres for both the Cyclone Rim and Adobe Town herds, and 100 acres for the Stewart Creek herd. In the absence of further development, no increased impacts to wild horse populations are anticipated.

4.2.4.5 Mitigation and Monitoring

Applicant-Committed Measures

No specific measures for wild horses are identified; however, many of the measures provided to minimize disturbance to other area resources would benefit wild horses.

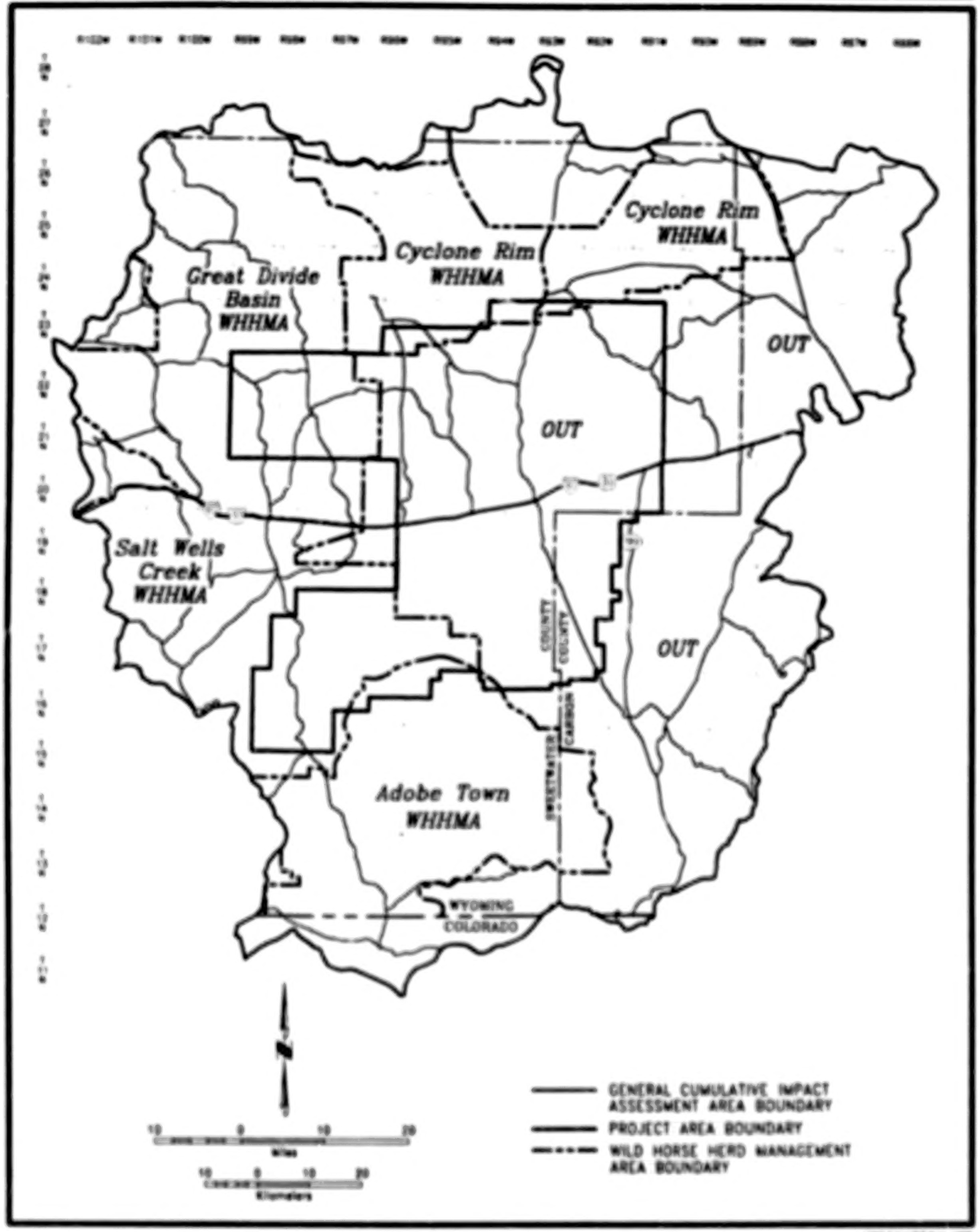
Additional Potential BLM-Required Mitigation

Loss of forage could be limited by restricting disturbance to the minimum area necessary to conduct safe operations. Field personnel may be instructed on procedures designed to minimize disturbance to wild horses, especially during known stress periods such as breeding and foaling seasons. Open pits potentially hazardous to horses may require fencing.

Revegetation may require initiation as soon as areas are no longer required for safe and efficient project operation. Upon project completion, all surface equipment would be removed from the CD/WIIPA, and all disturbed sites would be reclaimed to restore ground cover and forage species.

4.2.4.6 Cumulative Impacts

The cumulative impacts analysis area for wild horses is the affected WHHMAs within the GCIAA (see Table 4.1 and Map 4.8). Within these areas, existing, proposed, and potential developments would result in increased habitat loss and indirect disturbance; however, range conditions are not anticipated to decline as a result of proposed and potential future projects. Therefore, the loss of habitat due to project construction is not anticipated to result in significant impacts to wild horses. Long-term surface disturbance resulting from existing, proposed, and potential future developments within the GCIAA is approximately 18,600 acres (3.5%), 19,000 acres (2.6%), 1,600 acres (0.6%), 1,200 acres (0.5%), and



Map 4.8 Regional Wild Horses Herd Management Areas, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

2,600 acres (0.5%) in the Salt Wells Creek, Great Divide Basin, Cyclone Rim, Stewart Creek, and Adobe Town WHHMAs, respectively (Table 4.13). Cumulative impacts to wild horses are anticipated to be insignificant since wild horse population objectives are currently being met or exceeded in all affected WHHMAs, and reclamation activities have the potential to provide increased forage for wild horses for the long-term.

4.2.5 Federal Threatened and Endangered/State Sensitive Species

The BLM GDRA and GRRA RMPs (BLM 1990a, 1997a) and Standards for Healthy Rangelands (BLM 1997b) and state (WSLUC 1979) and local (THK 1977; UW 1991; Pedersen Planning Consultants 1997, 1998) land use plans address the following management objectives associated with federal T&E, special status, and state sensitive plant and animal species:

- to provide, maintain, or improve habitat through vegetative manipulation, mitigation measures, or other management actions including habitat acquisition and easements;
- maintain or enhance essential and important habitat and prevent destruction or loss of the plant species communities and important habitat;
- maintain, improve, or enhance the biological diversity of plant and wildlife species while ensuring healthy ecosystems;
- to maintain or enhance habitats that support or could support T&E, species of concern, or state sensitive species;
- to provide opportunities for enhancing or expanding the habitat;
- to prevent the need for listing species as T&E; and
- to protect unique natural areas and endangered wildlife species by encouraging development that reduces unfavorable impacts on fragile areas.

The following analysis shows that the Proposed Action and alternatives are compatible with these management objectives, and no adverse effects to T&E species are anticipated. A complete analysis of impacts to T&E species is provided in the BA for this project (see Appendix E).

4.2.5.1 Proposed Action

Bald eagles and peregrine falcons may occasionally use the CD/WIIPA for foraging during winter or migrations, but no known nests or roosting areas have been reported in the area. No adverse impacts to bald eagles roosts along the Little Snake River southeast of the CD/WIIPA are anticipated. No adverse impacts to bald eagles or peregrine falcons that potentially hunt on the CD/WIIPA are expected. In the event that bald eagle or peregrine falcon nests or roosts are discovered on the CD/WIIPA, the BLM, USFWS, and WGFD would be consulted, and appropriate mitigation measures would be implemented to ensure that no impacts occur to these species.

Although no confirmed black-footed ferret sightings have been recorded for the CD/WIIPA, potential habitat exists in white-tailed prairie dog colonies in the area (see Map 3.11). If sufficient acreage and density of prairie dog colonies are present to constitute potential black-footed ferret habitat in areas proposed for disturbance, a survey per USFWS guidelines (USFWS 1989) would be conducted or alternative USFWS-approved mitigations would be applied (see Appendix E). Surveys would be implemented during APD and/or ROW reviews on a site-specific basis. In the unlikely event that black-footed ferrets are discovered during surveys, consultation and coordination with the USFWS would be required to ensure that no adverse impacts to the black-footed ferret result from the Proposed Action.

Most plant and animal species of special concern are not anticipated to be adversely impacted by the Proposed Action (see Appendix E). Species that could be adversely affected include ferruginous hawk, loggerhead shrike, western burrowing owl, mountain plover, and eastern short-horned lizard. However, since project development and operations would be performed in a manner to minimize disturbing potential habitat for these species, potential project impacts are not anticipated to jeopardize the continued existence of these species.

Table 4.13 Acreage of Direct Cumulative Surface Disturbance in Wild Horse Herd Management Areas, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

WHHMA[1]	Acreage Within GCIAA	Existing[2]	Proposed[3]	Potential Future[4]	Total	
					Acres[5]	Percentage[6]
Salt Wells Creek	524,200	14,300	2,900	1,400	18,600	3.5
Great Divide Basin	723,100	14,600	3,000	1,400	19,000	2.6
Cyclone Rim	259,000	1,100	400	100	1,600	0.6
Stewart Creek	220,000	1,000	100	100	1,200	0.6
Adobe Town	473,000	2,000	400	200	2,600	0.5

[1] Wild horse herd management area.

[2] Includes all existing disturbance within GCIAA.

[3] LOP disturbance from Proposed Action.

[4] Includes all projected disturbance within GCIAA.

[5] Total of existing, proposed, and potential future disturbance within GCIAA.

[6] Percent of WHHMA within GCIAA directly disturbed from existing, proposed (LOP), and potential future actions.

Although no potential conflict between active ferruginous hawk nest sites and project activity is anticipated at present, some adverse effects to the species are anticipated due to increased human presence in the area. Conflicts that may arise would be resolved by the BLM, in consultation with the USFWS and WGFD, to ensure that impacts to the species would be minimized. Adverse impacts resulting from loss of habitat for loggerhead shrike, western burrowing owl, eastern short-horned lizard, and mountain plover would likely occur due to proposed activities; however, due to the scattered nature of most habitat disturbance, it is anticipated that these species would not be permanently displaced. Pre-construction surveys would be conducted during APD and ROW application reviews to document the status of these species, and if these species are noted in areas to be disturbed, these locations would be avoided or moved until such time as project construction would not affect these species, or alternative protective measures would be stipulated (see Appendix E).

T&E and species of special concern occurring downstream of the CD/WIIPA within the Colorado River system would not likely be adversely affected by the Proposed Action since there would be no surface water withdrawals. No T&E and candidate fish species occur within CD/WIIPA surface waters.

Adverse impacts to state sensitive plant and animal species are not anticipated for most species, and no significant impacts are anticipated for any potentially affected species. Immobile species (i.e., plants) could be adversely affected in some areas due to surface-disturbing activities. Most mobile species would likely be displaced during construction. Adequate undisturbed habitats are available regionally for all potentially affected state sensitive species.

4.2.5.2 Alternative A

Impacts to T&E species, species of special concern, and state sensitive species under Alternative A would generally occur as described for the Proposed Action. The same mitigation measures as those identified for the Proposed Action would be implemented under Alternative A. Impacts to ferruginous hawk and other raptors are anticipated to be reduced under this alternative due to reduced surface disturbance and associated human activity in raptor nesting concentration areas, since these areas are included in SRAs (see Table 2.2).

4.2.5.3 Alternative B

Impacts to T&E species, species of special concern, and state sensitive species under Alternative B would generally occur as described for the Proposed Action. The same mitigation measures as those identified for the Proposed Action would be implemented under Alternative B. Impacts to ferruginous hawk and other raptors are anticipated to be reduced under this alternative due to reduced surface disturbance and associated human activity in raptor nesting concentration areas, since these areas are included in SRAs. Impacts to ferruginous hawks and other raptors are expected to be somewhat greater under this alternative than under Alternative A.

4.2.5.4 No Action

No increased impacts to T&E, candidate, proposed, species of special concern, and/or state sensitive species would occur under the No Action Alternative. Impacts would occur at existing authorized levels for affected species. However, impacts to T&E, candidate, proposed, and/or special status species under this alternative could be increased from those of the Proposed Action and Alternatives A and B due to the absence of coordinated reclamation, transportation, and wildlife protection planning efforts (see Appendices A, B, and D). Existing long-term disturbance in the CD/WIIPA totaling 14,800 acres (1.4% of the area) would continue for current CD/WIIPA land uses (see Table 4.2), and commensurate with existing oil and gas development policy, an estimated additional 6,400 acres of new disturbance and 2,400 acres of new long-term disturbance would likely result from future oil and gas exploration and development in the CD/WIIPA (see Table 2.1). Total surface disturbance in the CD/WIIPA under the No Action Alternative is estimated to be 24,800 acres (2.3% of the area) initially and 17,200 acres (1.6%) for the long-term (i.e., 30-50 years). In the absence of further CD/WIIPA development, no further impacts would occur to these species.

4.2.5.5 Mitigation and Monitoring
Applicant-Committed Measures

In addition to those already listed under vegetation and wildlife, the following measures would be applied.

- USFWS and WGFD consultation and coordination would be conducted as necessary for all mitigation activities related to raptors and T&E species (and their habitats), and all permits required for movement, removal, and/or establishment of raptor nests would be obtained.
- Site-specific surveys for federally listed T&E, candidate, and proposed plant and animal species and plant and animal species of concern would be conducted prior to surface disturbance in areas determined by the BLM to contain potential habitat for such species. These surveys would be completed by a qualified botanist or biologist as authorized by the BLM. Data from these surveys would be provided to the BLM, and if any T&E, candidate, proposed, or special status plant and animal species of concern or their habitats are found, BLM recommendations for avoidance or mitigation would be implemented. Minor relocation of project facilities would be made to avoid these species and/or their habitats. If avoidance is not possible, informal consultation with the USFWS would be initiated, as necessary.
- Mountain plover habitats (e.g., cushion plant communities, playa lakes) would be avoided where practical, and where these habitats would be disturbed, reclamation would utilize procedures designed to re-establish suitable plover habitat as directed by the BLM. Furthermore, mountain plover surveys would be conducted within suitable plover habitat on the CD/WIIPA by a qualified biologist in accordance with USFWS guidelines and as directed by the BLM. The survey procedures would include the following.
  - Visual observation of areas within 656 ft (200 m) of proposed disturbance would be made from stationary vehicles and/or ATVs to detect the presence of plovers. All plovers located would be observed long enough to determine if a nest is present.
  - Surveys would be conducted no more than 14 days prior to the date actual ground-disturbing activities begin. If two surveys are required, they would be made at least 14 days apart, with the last

survey no more than 14 days prior to the start-up date.

  - The number of surveys required to clear a site for mountain plovers prior to beginning a planned activity depends on the start-up date, as shown below.

Date of Planned Activity	# Surveys Required
March 15 - March 31	1
April 1 - June 30	2
July 1 - August 15	1

  - If an active plover nest is found in the survey area, the planned activity would be delayed at least 37 days or 1 week post-hatching. If a brood of flightless chicks is observed, activities would be delayed at least 7 days.
  - Road construction and maintenance (*i.e.*, grading) activities would be minimized from May 25 to June 30.
  - Where practical, no new surface-disturbing activities would be conducted from April 1 to June 30 within 656 ft (200 m) of identified mountain plover concentration areas (i.e., areas where broods and/or adults have been observed in the current year or documented in at least 2 of the past 3 years).
- Operators would consult with the USFWS and/or the BLM to determine if black-footed ferret searches are required. When ferret searches are required, they would be conducted in accordance with USFWS guidelines (USFWS 1989).
- Where possible, proposed disturbance areas would avoid prairie dog colonies which meet black-footed ferret habitat size and burrow density criteria (USFWS 1989).
- To protect T&E fish species downstream of the project area, no surface water or shallow ground waters in connection with live surface waters would be utilized for the proposed project.
- Pursuant to the *Endangered Species Act*, Operators would adhere to all survey, mitigation, and monitoring requirements identified in the BA for this project (see Appendix E)

Additional Potential BLM-Required Mitigation

All mitigation measures presented in the BA for this project may be required (see Appendix E). Additionally, those measures shown on Table 4.14 would be applied.

White-tailed prairie dog colony location mapping, as well as black-footed ferret surveys, may be conducted if deemed necessary by the BLM in consultation with the USFWS. Determinations would be made on a case-by-case basis during ROW application review and APD processes. Prairie dog colonies on the CD/WIIPA may be avoided to minimize disturbance to these areas.

In the event that bald eagle roosting areas are found on or adjacent to the CD/WIIPA, the area may be closed to surface-disturbing activities (e.g., construction, drilling) from November 1 through April 1. If active bald eagle or peregrine falcon nests are found, no activity or surface disturbance may be allowed for up to a 1.0-mi radius of nests between February 1 and July 31.

Surveys for state sensitive species (WGFD Priority Species and WNDDB listed species) could be implemented during on-site inspections of proposed ROWs and well locations as components of ROW application and APD review processes. If state species are found on the area, construction activities could be delayed or relocated such that activities would not disturb these species. Habitats in which these species are likely to occur could be avoided where possible.

4.2.5.6 Cumulative Impacts

Given that appropriate monitoring and mitigation measures for T&E species would be employed throughout regional development projects, it is anticipated that there would be no adverse cumulative effects to these species resulting from the implementation of the proposed project in combination with existing and potential future actions. In the absence of pre-disturbance surveys, T&E species could be adversely affected, and candidate species and species of special concern could be jeopardized. Adverse cumulative impacts to species of special concern and state sensitive species could occur

Table 4.14 BLM Requirements for Inventory, Monitoring, and Protection of Threatened, Endangered, Candidate, and Species of Special Concern, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Land Status	BLM Requirements[1]
BLM surface/BLM subsurface	Conduct data gathering and avoid or mitigate impacts as appropriate.
BLM surface/non-BLM subsurface	Conduct data gathering and avoid or mitigate impacts as appropriate.
Non-BLM surface/BLM subsurface[2]	Request landowner permission to access lands for inventory and, if granted, conduct data gathering on affected areas and require avoidance or mitigation of impacts, as appropriate. If permission is not granted, the BLM would require Operators to obtain access through appropriate legal action and, if obtained, conduct data gathering on affected areas and avoid or mitigate impacts, as appropriate. If legal access is not obtained, no on-site data gathering would be conducted, and all analyses would be done using alternate methods and so stated in the appropriate analysis document. If it is suspected that T&E, candidate, and other species of concern or their critical habitats may be affected, the USFWS would be notified.
Non-BLM surface/non-BLM subsurface and non-BLM surface/BLM subsurface[3]	Request landowner permission to access lands for inventory and, if granted, conduct data gathering on affected areas and require avoidance or mitigation of impacts, as appropriate. If permission is not granted, no on-site data gathering would be conducted and all analyses would be done using alternate methods and so stated in the appropriate analysis document. If it is suspected that T&E, candidate, and other species of concern or their critical habitats may be affected, the USFWS would be notified.

[1] The BLM may also require Operators to obtain appropriate T&E, candidate, and other species of concern resource data.

[2] For actions that are a direct result of the subsurface estate value (e.g., oil and gas exploration and development).

[3] For actions that are not a direct result of the subsurface estate (e.g., ROWs).

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as a result of potential future actions if increased activity and surface disturbance preclude the use of large areas by these species.

4.3 CULTURAL AND HISTORICAL RESOURCES

The BLM GDRA and GRRA RMPs (BLM 1990a, 1997a) and state (WSLUC 1979) and local (THK 1977; UW 1991; Pedersen Planning Consultants 1997, 1998) land use plans address the following management objectives associated with cultural and historical resources:

- to resolve conflicts between cultural resources and other resource uses;
- to expand the opportunities for scientific studies and educational and interpretive uses of cultural resources;
- to protect and preserve representative samples of the full array of cultural resources for the benefit of scientific and socio-cultural use by present and future generations;
- to manage cultural resources so that scientific and socio-cultural values are not diminished, but rather are maintained and enhanced;
- to ensure that cultural resources are given full consideration in all land use planning and management decisions;
- to conserve and develop scenic, historic, and other unique places; and
- to conserve, protect and maintain buildings and the integrity of areas that have historical significance.

The following analysis shows that the Proposed Action and alternatives are compatible with these management objectives, and no significant impacts are anticipated.

4.3.1 Proposed Action

Potential impacts to specific eligible or unevaluated properties are unknown at this time; however, it is likely that project construction activities would uncover cultural resource sites, and some of these sites would be NRHP eligible. Potential direct impacts to NRHP-eligible cultural properties would primarily result from construction-related activities; however, since these potential impacts would be mitigated on a case-by-case basis as determined during site-specific APD and ROW reviews, following procedures promulgated under the *National Historic Preservation Act* (NHPA) at 36 C.F.R. 800 and/or the NCPA and WSP, impacts would not be significant.

Contributing segments of the Overland Trail would be avoided on federal and private lands (subject to landowner preference or agreement) as necessary during construction. To provide a protective corridor for historic trails within the CD/WIIPA, general visual intrusion and surface disturbance would be restricted or prohibited within 0.25 mi or within the visual horizon, whichever is closer. Therefore, impacts to the trail are anticipated to be insignificant.

Some increase in indirect impacts to cultural resources, (e.g., unauthorized collection of artifacts) would occur due to increased access to the area. However, these impacts would be reduced due, in part, to the enforcement of the *Archaeological Resource Protection Act of 1979* (ARPA), and inventories and monitoring would locate most significant sites within and adjacent to disturbance areas.

Initial consultations with Native American groups indicated that no religious or culturally important areas for Native Americans occur in the CD/WIIPA, and further consultations with these groups may be conducted. If religious or culturally important sites are identified, the BLM would review the potential impacts on a site-specific basis to determine what measures are necessary to prevent or mitigate significant impacts to religious or culturally important areas. The surveys to determine the presence of eligible cultural resources, mitigations required to comply with the regulations and stipulations (see Section 4.3.5), and continued consultation with Native American groups, as necessary, would assure that overall impacts to cultural resources from the Proposed Action would be insignificant.

4.3.2 Alternative A

Potential impacts to cultural and historic resources under Alternative A would be similar but reduced from those described for the Proposed Action, since long-term surface disturbance would be reduced in SRAs which contain areas of high site densities (e.g., Delaney Rim, The Haystacks). Some increased impacts to cultural and historic resources on private surface are anticipated under this alternative. With the implementation of surface disturbance limitations, as well as mitigation measures identified for the Proposed Action (see Section 4.3.5), impacts would remain at insignificant levels.

4.3.3 Alternative B

Potential impacts to cultural and historic resources under Alternative B would likely be similar to, but reduced from, those described for the Proposed Action and increased from those of Alternative A. Impacts to cultural and historic resources on private lands under this alternative may be increased from those of the Proposed Action. With the implementation of mitigation measures as identified for the Proposed Action (see Section 4.3.5), impacts would remain at insignificant levels.

4.3.4 No Action

Under the No Action Alternative, no additional impacts to cultural and historic resources beyond currently authorized levels would occur. However, impacts to cultural and historic resources under this alternative could be increased from those of the Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts (see Appendices A and B). Unauthorized collection of artifacts would also continue at existing levels. In the absence of further CD/WIIPA developments, no new direct impacts to cultural or historic resources would occur.

4.3.5 Mitigation and Monitoring

4.3.5.1 Applicant-Committed Measures

- Operators would adhere to the Section 106 compliance process (36 C.F.R. 800) or NCPA and WSP prior to any surface-disturbing activity.
- Operators would halt construction activities in potentially affected areas if previously undetected cultural resource properties are discovered during construction. The BLM would be immediately notified, consultation with the SHPO and Advisory Council would be initiated as necessary, and proper mitigation measures would be developed pursuant to the WSP under the NCPA or 36 C.F.R. 800.11. Construction would not resume until a Notice to Proceed is issued by the BLM.
- Provisions similar to those of the *Oregon/Mormon Pioneer National Historic Trails Management Plan* (BLM 1986) or newly developed cultural resource management plans would be followed for any actions potentially affecting the Overland Trail, Cherokee Trail, and/or Lincoln Highway.
- Operators would pay the costs of BLM-required mitigation for cultural resources.

4.3.5.2 Additional Potential BLM-Required Mitigation

Impacts to cultural resources would be mitigated following procedures as specified in 36 C.F.R. 800 and/or the national programmatic agreement for cultural resources and statewide protocol. Class I and Class III inventories would be conducted prior to disturbance on all federal lands and on state and private lands affected by federal undertakings unless landowner denial for access is documented in writing. Where land owners deny access, alternative cultural resource mitigation resolution methodologies may be applied or the development may be denied. In selective areas identified by the BLM, cultural resource surveys may require testing and/or mitigation to determine significance. All resources identified during these inventories would be evaluated for eligibility for the NRHP by the BLM. SHPO would be consulted as necessary under the statewide protocol. In addition, all eligible or listed sites identified in Class I search and Class III inventories would be avoided or mitigated, as would areas with high potential for significant cultural deposits, such as aeolian deposits, alluvial deposits along perennial waterways and other major drainages and terraces, and colluvial deposits at the base of low slopes and hills, where possible. If any NRHP (eligible or listed) sites found within proposed disturbance areas cannot be avoided, a data recovery program or other mitigation would be implemented as deemed appropriate by the BLM in consultation with SHPO, Advisory Council on Historic Preservation as necessary, and the Operators. Cultural sites identified during inventories would be avoided, where possible.

If a large number of sites cannot be avoided or other adverse effects could occur, a programmatic agreement among the aforementioned parties may be developed. Programmatic agreements would usually be in place when properties are subjected to mitigation through data recovery. Additionally, programmatic agreements and/or discovery plans may be required to be in place prior to approval of APDs or ROW applications in areas with high densities of cultural resource sites near The Haystacks.

In addition to Class I and Class III inventories, construction activities in areas where the BLM believes there is a high potential for buried cultural deposits may be monitored by a BLM-permitted archaeologist. If historic or prehistoric materials are discovered during construction, further surface-disturbing activities at the site (in an area defined by the Authorized Officer) would cease immediately, and appropriate BLM personnel would be notified by the Operators to assure proper handling of the discovery by qualified archaeologists. An evaluation would be made by the Authorized Officer to determine appropriate actions to prevent the loss of significant cultural resources. Operators may be responsible for the cost of site evaluation, and mitigation and any decision as to proper mitigation measures (e.g., data recovery) would be made by the Authorized Officer after consulting SHPO, Advisory Council on Historic Preservation as appropriate, and the Operators.

All field personnel could be informed by Operators of the importance of cultural resources and the regulatory obligations to protect such resources. Any cultural resource (historic or prehistoric site or object) discovered on public land by the Operators or any person working on their behalf would be immediately reported to the Authorized Officer. The BLM may require Operators to instruct field personnel not to disturb cultural resource sites or collect artifacts and that disturbance and collection of cultural materials is prohibited and against the law.

The BLM may require Operators to have a qualified historian conduct an inventory of the Overland Trail, Evans' route of the Cherokee Trail, and/or Lincoln Highway across the CD/WIIPA. Portions of these historic trails that contribute to their NRHP eligibility would be avoided within 0.25 mi unless such disturbance would not be visible from the trail or would occur in an existing visual intrusion area. If any area of religious or cultural importance to Native American groups is identified on public lands, the BLM would review the potential impacts on a site-specific basis to determine appropriate mitigation measures.

4.3.6 Cumulative Impacts

Disturbance and/or loss of unidentified sites or artifacts could add to the cumulative loss of information about our heritage in the CD/WIIPA and throughout the region if these resources are not identified, inventoried, and/or appropriately protected prior to disturbance. However, such losses are not expected since mitigation measures as identified for the Proposed Action would be implemented under all proposed and potential future regional development projects.

4.4 SOCIOECONOMICS

The BLM GDRA and GRRA RMPs (BLM 1990a, 1997a) and state (WSLUC 1979) and local (THK 1977; UW 1991; Pedersen Planning Consultants 1997, 1998) land use plans address the following management objectives associated with socioeconomics:

- to coordinate land use decisions with economic factors;
- to encourage growth in an orderly and efficient manner;
- to provide for the socioeconomic betterment through the diversification of the economic base and retention of existing commerce and industry;
- to provide opportunity for leasing, exploration, and development of oil and gas while protecting other resource values;
- to enhance the tourist industry;
- to maintain and protect the beauty of natural vistas; and
- to achieve a balance between resource conservation and economic development.

The following analysis shows that the Proposed Action and alternatives generally are compatible with these management objectives; however, significant adverse effects to rural residential areas could occur under the Proposed Action in the event that area residents are displaced due to project development impacts (noise, odor, visual, or aesthetic impacts). Further, if development on the area is denied or curtailed (No Action), significant impacts could occur due to loss of revenues.

4.4.1 Proposed Action

Population changes in both Carbon and Sweetwater Counties due to the project would be negligible and of relatively short duration. There would be a beneficial effect on local employment and local economics throughout the LOP, especially during construction and development when as many as 753 people may be required for the project (Table 2.3). The drill rigs would employ both local and transient personnel. It is not possible to determine where drill crews would live; however, Rawlins is approximately 30 mi from the CD/WIIPA and would likely be selected by many transient employees. Local drill crews would, by definition, already reside in the area. It is unlikely that transient workers would permanently relocate to the communities potentially affected by the development.

Local communities would experience beneficial economic impacts through an increase in consumption of local goods and services (e.g., earthwork on well locations and roads is usually contracted to local construction companies, and it is likely that employees would spend some of their payroll in these communities). Decreased vacancy rates and increased sales tax revenues would also occur as a result of the project. Most of these beneficial impacts would be short-term during drilling and construction, but benefits would continue at lower levels throughout the LOP.

Significant adverse impacts to rural residential areas could occur if area residents are displaced due to the presence of development activities near their homes. Impacts could result from increased noise, offensive odors, loss of aesthetics, and/or visual landscape perturbations (see Sections 4.1.1, 4.1.8, 4.5, and 4.6).

Estimated state and local taxes and federal royalties on the gross revenue from gas and oil production in the first 25 years of the LOP are given in Table 4.15. Additional revenue would be generated through the property taxes on surface facilities and sales and use taxes paid for equipment. Wyoming and the affected counties and cities have been adversely affected by declines in mineral revenues over the past several years, and the added revenues generated from the Proposed Action would help offset some of these revenue declines. No revenue losses associated with potential reductions in dispersed recreation on portions of the CD/WIIPA are anticipated.

It is estimated that the Proposed Action would provide 13,081 worker-years of employment during the LOP, over half of which (8,504 worker-years) would occur during the first 10 to 20 years of the project as wells are drilled and completed. Approximately $660 million of the estimated $3.3 billion required for construction, drilling, and completion of the 3,000 proposed well locations would be for worker salaries (i.e., $33-$66 million per year during the 10-20 years of project development). An additional $253 million in salaries are estimated to be paid during the remaining 20 to 30 years of the project (i.e., $8.4-$12.6 million per year). Assuming an earnings multiplier of 1.778 (BLM 1997d), the total annual income effect in Wyoming would be an estimated $1.6 billion for the LOP ($1.2 billion during project development and $0.4 billion during production). The mining industry, which includes natural gas production, pays the highest average wage of any industry group in Sweetwater and Carbon Counties.

Fifty to 60 workers would be involved in construction, drilling, and completing a well, and the Operators propose utilizing up to 15 drilling rigs at any given time. With appropriate development planning (e.g., wellpad and road construction outside crucial winter or nesting periods, drilling and construction of wells at locations away from sensitive wildlife areas during seasonal restriction periods), no seasonal reductions in the required workforce are anticipated. It is estimated that approximately 150 to 200 wells would be drilled and completed each year during project development. A maximum of about 750 workers may be required at any one time during the initial 15-20 years of project development if three construction crews, 15 drilling rigs, and 15 completion crews were operating simultaneously. From 50 to 60 workers would be required annually during the production phase of this project (20 to 30 years).

Construction workers would be local, whereas drilling and completion workers could be both local and transient, however, they most likely would be from

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Table 4.15 Estimated Gas and Condensate Production, State and Local Severance Taxes, and Federal Royalties for the First 25 Years of Operation, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Year	Gas Production (mmcfx1,000)[1]	Gas Price ($/mcf)[2]	Condensate Production (mbblx1,000)[3]	Condensate Price ($/bbl)[2]	State and Local Taxes ($x1,000,000)[4]	Federal Royalty ($x1,000,000)[5]
1999	50	1.96	10	20.27	40	19
2000	150	1.97	20	20.37	94	44
2001	250	1.98	30	20.47	148	69
2002	300	1.99	40	20.58	189	89
2003	350	2.00	50	20.69	231	108
2004	300	2.01	45	20.78	205	96
2005	250	2.02	40	20.89	179	84
2006	200	2.03	35	20.99	152	71
2007	150	2.04	30	21.10	125	59
2008	100	2.05	25	21.20	98	46
2009	90	2.06	20	21.31	82	38
2010	80	2.07	15	21.41	65	30
2011	70	2.08	10	21.52	48	23
2012	60	2.09	8	21.63	40	19
2013	50	2.10	7	21.74	34	16
2014	40	2.11	6	21.84	29	13
2015	30	2.12	5	21.95	23	11
2016	20	2.13	4	22.06	17	8
2017	15	2.14	3	22.17	13	6
2018	10	2.15	2	22.28	9	4
2019	5	2.17	1	22.40	4	2
2020	5	2.18	1	22.51	4	2
2021	5	2.19	1	22.62	4	2
2022	4	2.20	1	22.73	4	2
2023	3	2.21	1	22.85	4	2
2024	2	2.22	1	22.96	4	2
Ave.	--	2.09	--	21.59	--	--
Total	2,589	--	411	--	1,845	865

[1] mmcf = million cubic feet.

[2] Gas and condensate prices are based on the average 1997 prices escalated at a 0.5% annual rate through 2024; $/mcf = price per thousand cubic feet; $/bbl = price per barrel.

[3] mbbl = thousand barrels.

[4] State and local taxes are assumed to be a 6.0015% and 7.34%, respectively, on all revenue.

[5] Based on 1,500 wells on federal lands with a 12.5% royalty interest.

Wyoming. It is not possible to determine where transient workers would live, but local drill crews would, by definition, already reside in the area. Transient workers likely would occupy temporary housing in Rock Springs, Wamsutter, or Rawlins where housing would be available for the relatively few transient workers.

The project would generate substantial revenues for the U.S., state, county, and local governments, including school districts, through ad valorem taxes, severance taxes, federal royalties, and other taxes on facilities and production. It is estimated that, during the first 25 years of operations, gross income from the production of 2.6 tcf of natural gas and 41.1 million bbl of condensate would be $14 billion (Table 4.15). Of this gross revenue, $865 million would be paid in federal royalties (half of which is returned to the state), and $1.8 billion would be paid in state and local taxes. In addition, property tax revenues would increase due to the increased tax base resulting from capital improvements in the field, and drilling activities and the purchase of project-associated equipment and supplies would provide additional sales tax monies to the state and county.

Adverse effects may occur during drilling activities on a localized basis if too many workers concentrate in a small town, such as Wamsutter, such that infrastructure and services cannot meet the demand; however, these impacts, if they occur at all, are expected to not be significant and would be short-term due to the mobility of the workforce and availability of alternative communities with increased excess capacity. Crime may potentially increase, and local sheriff and police departments would have additional population in their jurisdiction. There may be a minor increase in need for law enforcement services. The WGFD may need to increase enforcement activities in the CD/WIIPA because improved access would allow poachers to travel more easily through areas not previously patrolled by the WGFD.

The infrastructure of all communities within commuting distance of the CD/WIIPA would be able to accommodate the workers and their families during drilling operations. Sufficient motels and temporary housing are present in Rawlins for use by the workers; therefore, adverse impacts would not be significant. The towns potentially impacted by the project have developed in a boom-bust mode, and the short-term increase in population associated with the Proposed Action is not expected to adversely impact the character of the communities or existing social traditions.

Upon completion of drilling, the drill rigs and their crews would be released, which may result in emigration and/or the return of local unemployment rates to near preproject levels.

An increase in travel on access roads to the CD/WIIPA may adversely affect traffic safety during drilling and construction. Operators would educate employees regarding safe operations of vehicles on the CD/WIIPA (e.g., appropriate speed limits, potentially hazardous situations), and with the proper planning and design of roads as specified in the TP for this project (see Appendix B), potential impacts to public safety are anticipated to be insignificant. Roads used frequently by trucks, equipment, and workers traveling to and from the CD/WIIPA would require maintenance for the LOP. All nonstate and noncounty roads in the CD/WIIPA developed or improved for the Proposed Action would be maintained by Operators, as necessary, to ensure safety and prevent degradation of the transportation system. Road maintenance agreements among Operators would be prepared (BLM 1998a). These agreements would identify which Operators would maintain the various roads and the extent and timing of maintenance requirements. All road maintenance agreements would be submitted to the BLM for approval. On private lands, where roads are not constructed or upgraded to meet BLM specifications, increased impacts to transportation could occur (i.e., road failure, stuck vehicles).

4.4.2 Alternative A

Socioeconomic impacts under Alternative A generally would be the same as described for the Proposed Action. However, the likelihood of significant adverse impacts would be reduced under this alternative due to the surface disturbance limitations in SRAs which include areas proximal to rural residences.

4.4.3 Alternative B

Socioeconomic impacts under Alternative B generally would be the same as described for the Proposed Action. However, the likelihood of significant adverse impacts would be increased from those of Alternative A, but less than those of the Proposed Action.

4.4.4 No Action

If the proposed project were curtailed or not undertaken, natural gas and oil reserves in the area would not be developed expeditiously, and the state, region, and local communities would not benefit from the increased economic activity and income. Potentially benefitted communities may remain economically depressed, and potential impacts could be significant. Further, socioeconomic impacts could be increased from those of the Proposed Action and Alternatives A and B due to the absence of reclamation, transportation, and wildlife protection planning efforts (see Appendices A, B, and D).

4.4.5 Mitigation and Monitoring

4.4.5.1 Applicant-Committed Measures

Operators would implement hiring policies that encourage the use of local or regional workers.

4.4.5.2 Additional Potential BLM-Required Mitigation

Operators may be required to schedule concentrations of project traffic, such as truck convoys or heavy traffic flows, to avoid periods of expected heavy traffic flows associated with recreation (e.g., opening day of pronghorn season). Travel and parking may be restricted to access roads and on-site parking areas, respectively. Additional measures relevant to socioeconomics are provided in Section 4.5.5.2.

4.4.6 Cumulative Impacts

The availability of temporary housing and current regional infrastructures would allow the proposed project along with other regional developments in Sweetwater and Carbon Counties to be conducted simultaneously without adversely affecting available resources. Sufficient motels, empty trailer spaces, and vacant housing are available. Communities in the region have experienced significant population declines in the past and have sufficient existing infrastructures to accommodate proposed and potential future personnel working in the region. The basic character of existing communities would not be changed due to the additional people working in the area. There would likely be an increased demand for law enforcement, including WGFD personnel, due to the increased number of people associated with the various projects. Increased law enforcement along access roads may be necessary to maintain transportation safety due to potential increases in traffic volumes.

The cumulative impacts on the local economy, tax base, and revenues due to the proposed project and other existing and potential future projects in the region would be beneficial. The economics of local communities have been depressed due to recent reductions in jobs, populations, and revenues, so stimulation of the economy associated with the payrolls, taxes, and royalty revenues from these projects would be beneficial and offset these reductions.

4.5 LAND USE

The BLM GDRA and GRRA RMPs (BLM 1990a, 1997a) and state (WSLUC 1979) and local (THK 1977; UW 1991; Pedersen Planning Consultants 1997, 1998) land use plans address the following management objectives associated with land use:

- to coordinate land use decisions with economic factors;
- to plan for the orderly development of all urban lands;
- to encourage development of safe and sanitary housing capable of accommodating all people in the community;
- to provide for a cooperative process of land use planning with local, state, and federal government;
- to maintain or improve the quality of air, water, and land resources;
- to support residential land uses/expansion areas;
- to review EAs and EISs associated with all resource management decisions (timber sales, wilderness areas, fish and wildlife resources, water quality, improvement projects);
- to review all land exchanges;
- to manage the public lands to support the goals and objectives of other resource programs;

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- to respond to public demand for land use authorizations; and
- to acquire administrative and public access where necessary.

The following analysis shows that the Proposed Action and alternatives are generally compatible with these management objectives; however, significant impacts could occur to rural residential areas under the Proposed Action in the event that area residents are displaced due to project development impacts (noise, odor, visual, or aesthetic impacts) (see Sections 4.1.1, 4.1.8, 4.4, and 4.6).

4.5.1 Proposed Action

There would be no change in surface ownership as a result of the Proposed Action, nor would there be any change in designated land uses, which include oil and gas production, livestock grazing, wildlife habitat, and recreation. However, gas production would become a more prevalent use of the area, and in areas proximal to rural residences, some adverse impacts to residents may occur (e.g., increased human activity, visual impacts, odor, noise) (see Sections 4.1.1, 4.1.8, 4.4, and 4.6). In the event that rural residents are exposed to unnecessary and unreasonable hazards (e.g., pipeline ruptures), exposed to adverse health effects, and/or are displaced, significant impacts would occur. However, no unreasonable hazards are anticipated, and no health impacts are anticipated (see Section 4.1.1.). Additionally, the Proposed Action would be in conformance with applicable county, state, and federal land use plans, and impacts to most land uses are not anticipated to be significant.

Operators have leases to develop reserves throughout the CD/WIIPA, and proposed operations would not infringe on existing CD/WIIPA ROWs. Furthermore, existing power lines and pipelines would be avoided, where practical, during construction. No reductions in BLM authorized stocking rates for grazing allotments are anticipated. Therefore, the proposed project is not likely to have significant impacts to prior rights on the CD/WIIPA.

An estimated maximum of 33,600 acres (3.2%) of the CD/WIIPA would be initially required for the Proposed Action (Table 2.1). Initial reclamation following drilling and construction would reduce this initial disturbance to 15,900 acres (1.5% of the CD/WIIPA). Disturbance associated with project activities would be dispersed over approximately 1,136 mi^2, thereby distributing disturbances to livestock, wildlife, wild horses, and outdoor recreation over the entire CD/WIIPA. The project would temporarily displace or interfere with some historical land uses on a localized basis as described below.

4.5.1.1 Agriculture/Rangeland

The BLM GDRA and GRRA RMPs (BLM 1990a, 1997a) and state (WSLUC 1979) and local (THK 1977; UW 1991; Pedersen Planning Consultants 1997, 1998) land use plans address the following management objectives associated with agriculture/rangeland:

- to ensure the highest use of agricultural-rural lands and the most efficient planning method for continued utilization;
- to plan for the continuing use of agricultural-rural lands and for the potential of change in the use of those lands;
- to minimize the adverse effects of development on agricultural productivity and other adjacent and nearby properties;
- to provide for a cooperative land use planning with local, state, and federal government;
- to achieve balanced and compatible land uses which protect natural resources while, at the same time, meet the economic and social needs of the people;
- to recommend that all lands that are suitable for agriculture be designated as such and that these lands be used for future agriculture unless existing land uses preclude agricultural activities;
- to review and modify existing grazing permits and grazing allotments;
- to coordinate grazing permits with state and federal agencies;
- to improve forage production and ecological conditions for the benefit of livestock use, wildlife habitat, watershed, and riparian habitat;
- to restore, maintain, or improve riparian habitat to enhance forage conditions, wildlife habitat, and stream quality; and
- to achieve proper functioning condition or better on riparian areas.

The following analysis shows that the Proposed Action and alternatives are compatible with these management objectives, and no significant impacts are anticipated.

Livestock grazing would continue within the CD/WIIPA during all phases of the project. However, there would be some reduction in forage availability in areas where construction and drilling is occurring. Actual loss of AUMs, if 1.7% of the CD/WIIPA would be disturbed over the LOP, would be approximately 1,856 AUMs over the LOP. The greatest potential loss of AUMs for a single grazing allotment would occur within the Rock Springs Allotment, where an estimated maximum of approximately 595 AUMs would be lost for the LOP. Total impacts to AUMs and impacts within any single allotment are both considered insignificant primarily because it is anticipated that grass forage production--the forage preferred by livestock and wild horses--on reclaimed areas would be greater than predisturbance grass cover, thereby reducing potential AUM losses. Long-term effects to grazing and general livestock use are anticipated to be insignificant.

4.5.1.2 Recreation

The BLM GDRA and GRRA RMPs (BLM 1990a, 1997a) and state (WSLUC 1979) and local (THK 1977; UW 1991; Pedersen Planning Consultants 1997, 1998) land use plans address the following management objectives associated with recreation:

- to provide adequate recreational facilities (indoor and outdoor), parks, and open spaces for present and future generations;
- to conserve and develop scenic, historic, and unique places;
- to meet legal requirements for the health and safety of visitors;
- to mitigate conflicts between recreation and other types of resource uses;
- to coordinate land use decisions with economic factors;
- to enhance the tourist industry; and
- to avoid disruption of environmentally sensitive areas or critical habitat by inappropriate recreational, residential, or commercial development.

The following analysis shows that the Proposed Action and alternatives are compatible with these management objectives and most impacts are anticipated to be insignificant.

No developed recreation sites or facilities or ACECs exist in the CD/WIIPA; therefore, none would be affected. Whereas WSAs are also absent from the CD/WIIPA, the Adobe Town WSA occurs approximately 1 mi south of the area, and the Alkali Basin/East Sand Dunes and Red Lake WSAs are present 1 mi north of the CD/WIIPA (see Map 3.16). Some project facilities (e.g., drill rigs) may be visible from these WSAs; however, impacts to recreation in the WSAs are expected to be insignificant since all proposed project activities would be in compliance with the BLM's policy for management of WSAs (BLM 1987b). There would be some long-term displacement of existing dispersed recreation on the CD/WIIPA due to the presence of gas field development activities in some areas, and some users may perceive this impact as significant. However, access would be improved to the area, and this would likely increase motorized recreational uses, enhancing recreational experiences for some users. The Proposed Action is not anticipated to result in significantly reduced populations of game animals; therefore impacts to most hunters and hunting are not anticipated to be significant. Impacts to recreational users of the Overland Trail would result from the addition of project-related intrusions into the viewsheds from the trail. Impacts to most recreation uses are anticipated to be insignificant for the LOP.

Numerous dispersed recreational activities are available throughout the year in the CD/WIIPA; however, the number of individuals and amount of recreation time spent in the CD/WIIPA are not known. During the drilling and construction phase, noise, dust, traffic, the presence of equipment, and associated human activities would change the character of the area and diminish some recreational experiences, such as backcountry hiking and camping, wild horse and wildlife observation, horseback riding, nature photography, and big game hunting. Large tracts of land would remain available for dispersed recreational activities on WSAs adjacent to the CD/WIIPA. Once drilling and construction have been completed and equipment and human activity are reduced, impacts to recreation would be reduced for the LOP. Wildlife and wild horses would continue to use the area and would, for the most part, adapt to changes brought about by construction. With improved access to the CD/WIIPA, poaching and disturbance of big game may increase slightly. In addition, areas proximal to well locations and other facilities may be avoided by some hunters and wildlife and wild horse observers, negatively affecting recreational experiences (may be perceived as significant by some recreationists). However, increased accessibility throughout the CD/WIIPA would enhance opportunities for hunting and wildlife and wild horse observation for some recreational users. Some roads may be retained upon project completion allowing a permanent increase in some recreational uses of the area.

4.5.1.3 Transportation

The BLM GDRA and GRRA RMPs (BLM 1990a, 1997a) and state (WSLUC 1979) and local (THK 1977; UW 1991; Pedersen Planning Consultants 1997, 1998) land use plans address the following management objectives associated with transportation:

- to provide public facilities and services including safe and efficient transportation and utility systems that will serve the complete range of land uses;
- to develop and provide for a safe and efficient system of thorough-fares to allow for the adequate transportation of people, goods, and services;
- to ensure that all landowners are provided with legal access between their property and a designated and maintained public road;
- to acquire administrative and public access where necessary;
- to review resource management decisions that impact vehicular road access;
- to coordinate road development, closure, and use decisions with affected counties; and
- to provide an opportunity for off-road vehicle use in conformance with other resource management objectives.

The following analysis shows that the Proposed Action and development alternatives are compatible with these management objectives, and no significant impacts are anticipated. However, under the No Action Alternative, significant impacts could occur since transportation planning efforts would not occur (see Appendix B).

Estimated traffic requirements for the proposed project are presented in Table 2.4, and the WDOT has indicated existing interstate and county roads would be able to accommodate the additional traffic generated from the Proposed Action (personal communication with Adam Uhrich, Transportation Survey Supervisor, WDOT, and John Lane, Highway Engineer, WDOT, 1995). Therefore, impacts to these roads resulting from increased traffic would not be significant. An increase in travel on existing and newly constructed BLM roads in the CD/WIIPA would likely not have significant impacts during construction and drilling and for the LOP. The design of new and upgraded roads in the CD/WIIPA would be in compliance with BLM road standard guidelines (BLM 1985, 1991a), the TP for this project (see Appendix B), annual updates to the TPTSD (BLM 1999a), and individually approved APDs and ROW applications. Further, Sweetwater and Carbon Counties and the WDOT would be consulted, as appropriate, during transportation planning such that all appropriate standards for road construction and safety are met.

Impacts to existing, upgraded, and newly constructed roads on the project area could result from inadequate road maintenance resulting in road failure. While maintenance agreements would be established by area Operators, adverse weather conditions coupled with increased traffic may result in roads being temporally impassable (i.e., stuck vehicles, vehicles driving off roads). With adherence to BLM road standards (BLM 1985, 1991a) and maintenance specifications presented in Appendix B and BLM (1998a), these impacts are anticipated to be insignificant.

Roads on private lands in the CD/WIIPA would likely be constructed using alternative procedures from those on BLM lands. Inadequate road construction and maintenance in these areas could result in increased transportation impacts; however, this is beyond the control of the BLM.

4.5.2 Alternative A

Most impacts resulting from Alternative A would be the same as described for the Proposed Action; however, with the application of surface disturbance

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limitations in SRAs, which include areas proximal to residences, impacts to area residents may be decreased from those of the Proposed Action. Some Operators may increase their development actions on private lands which could augment impacts in these areas.

4.5.3 Alternative B

Impacts resulting from Alternative B would be the same as described for the Proposed Action; however, with the application of surface disturbance limitations in SRAs, which include areas proximal to residences, impacts to area residents may be decreased from those of the Proposed Action and increased from those of Alternative A. Some Operators may increase their development actions on private lands which could augment impacts in these areas.

4.5.4 No Action

Under the No Action Alternative, land use impacts would continue at existing authorized levels. However, impacts to land use under this alternative could be increased from those of the Proposed Action and Alternatives A and B due to the absence of coordinated reclamation, transportation, and wildlife protection planning efforts (see Appendices A, B, and D). Existing long-term disturbance in the CD/WIIPA totaling 14,800 acres (1.4% of the area) would continue for current CD/WIIPA land uses (see Table 4.2), and commensurate with existing oil and gas development policy, an estimated additional 6,400 acres of new disturbance and 2,400 acres of new long-term disturbance would likely result from future oil and gas exploration and development in the CD/WIIPA (see Table 2.1). Total surface disturbance in the CD/WIIPA under the No Action Alternative is estimated to be 24,800 acres (2.3% of the area) initially and 17,200 acres (1.6%) for the long-term (i.e., 30-50 years). Recreational use of the area would likely continue to increase as would regional traffic. In the absence of further CD/WIIPA developments, no increased impacts to land use are anticipated.

4.5.5 Mitigation and Monitoring

4.5.5.1 Applicant-Committed Measures

- Operators would coordinate project activities with ranching operations to minimize conflicts with livestock movement or other ranch operations.
- Operators would maintain all fences, cattle guards, and other livestock-related structures required for their transportation network.
- In areas of high livestock use, reclaimed area fencing would be utilized as necessary to ensure successful vegetation establishment.
- Roads, power lines, and pipelines would be located adjacent to existing compatible linear facilities wherever possible.
- Operators would post appropriate warning signs and require project vehicles to adhere to appropriate speed limits on project-required roads.
- Operators would inform their employees, contractors, and subcontractors that long-term camping (greater than 14 days) on federal lands or at federal recreation sites is prohibited.
- Operators would direct their employees, contractors, and subcontractors to abide by all state and federal laws and regulations regarding hunting and artifact collecting.
- Detailed practices and procedures as specified in the TP for this project (Appendix B) would be followed. Annual TPTSD updates (BLM 1999a) would be developed and would identify the minimum road network required to support annually proposed project activities, as well as construction and maintenance responsibilities of the Operators. Annual TPTSD updates would also identify dust abatement, road construction, and surfacing requirements.
- Existing roads would be used to the maximum extent possible and upgraded as necessary.
- All Operator-constructed roads not required for routine operation and maintenance of

producing wells or ancillary facilities would be reclaimed as directed by the BLM, State Land Board, or private landowner. As necessary, these roads would be permanently blocked, recontoured, reclaimed, and revegetated by Operators, as would disturbed areas associated with permanently plugged and abandoned wells.

- Where required by the BLM, site-specific centerline surveys and/or detailed construction designs would be submitted to and approved by the BLM prior to road construction.
- Operators would comply with existing federal, state, and county requirements and restrictions to protect road networks and the traveling public.
- Special arrangements would be made with the WDOT to transport oversize loads to the CD/WIIPA. Otherwise, load limits would be observed at all times to prevent damage to existing road surfaces.
- All development activities along approved ROWs would be restricted to areas authorized in the approved ROW.
- Operators would be responsible for maintenance of roads in the project area and for closure of roads following production activities.
- Where proposed roads would follow existing roads, those portions of existing roads not included in the new ROW would be reclaimed and revegetated by the Operator.
- Available topsoil (up to 12 inches) would be stripped from all road corridors prior to commencement of construction activities and would be redistributed and reseeded on backslope areas of the borrow ditch after completion of road construction activities. Borrow ditches would be reseeded in the first appropriate season after initial disturbance.

4.5.5.2 Additional Potential BLM-Required Mitigation

Preliminary road design plans are addressed in the TP (see Appendix B) and TPTSD (BLM 1999a) for this project, which is available for review at the BLM RFO and RSFO. In addition, annual TPTSD updates based on tentative yearly development scenarios would be prepared. Existing roads in the CD/WIIPA would be considered first for use as collector, local, and resource roads. These roads would be utilized whenever possible in lieu of new construction because the BLM will not foster the proliferation of separate ROWs or perpetuate duplicate road systems on public lands. A preliminary road design plan for CD/WIIPA collector and local roads (i.e., high-volume all-weather roads) is provided in the TP (see Appendix B). Standards for road design and construction would be consistent with the BLM road standards manual (BLM 1985, 1991a), and a BLM District Engineer would approve all road design plans.

Individual road design plans for new and/or improved roads would be submitted for approval as components of APDs or ROW permits. All new and improved roads would adhere to BLM road design and construction guidelines, and plans must be approved prior to initiation of work. The Operators would schedule a review of plans with sufficient time to obtain BLM approval prior to commencement of work. Additionally, all newly constructed roads on public lands not required for project operation and maintenance or existing area activities would be recontoured, reseeded, and permanently blocked, as deemed appropriate by the BLM. Roads on private lands would be similarly treated, subject to landowner preference or agreement.

The Operators would be responsible for necessary preventative and corrective road maintenance for the duration of the project and would be required to develop joint road use agreements designating road development, maintenance, and use requirements by area users. The road use agreements would identify responsibilities for necessary preventative and corrective road maintenance throughout the LOP (BLM 1999a). Maintenance responsibilities may include, but are not limited to, blading, gravel surfacing, cleaning ditches and drainage facilities, dust abatement, noxious weed control, culvert maintenance and repair, or other requirements as directed by the Authorized Officer. Site-specific maintenance responsibilities, including responsible parties, would be identified in annual TPTSD updates (BLM 1999a).

Mitigation for loss of forage may entail the reclamation of disturbed sites to range conditions equal to or better than preproject conditions. Reclamation of nonessential areas disturbed during construction activities may be required for the first appropriate season after well completion. Nonessential areas include 3.3 acres of well locations, approximately 23 ft of new road ROWs, entire pipeline ROWs outside of road ROWs, and all roads and associated disturbed areas at nonproductive well locations. Operators may be required to repair or replace fences and cattle guards, gates, drift fences, and natural barriers to maintain current BLM standards. Cattle guards could be used instead of gates for livestock control on most road ROWs. Livestock would be protected from pipeline trenches, and livestock access to existing water sources would be maintained.

All well locations (surface equipment and structures), most roads, [illegible] surface portions of pipelines, ancillary facilities, and other disturbed sites could be removed/reclaimed upon project completion to re-establish wildlife habitat and restore the area for recreation.

Mitigation [illegible] prior rights may include:

- coordination of proposed activities with other [illegible]/WIIPA land users;
- restriction of development activities (e.g., construction of wells, roads, pipelines) on federally managed sections proximal to area residents;
- limiting drilling operations to lands leased or owned by the Operators;
- locating wells away from known underground cables;
- regrading and repairing roads as necessary in areas damaged by project activities;
- re-establishing a level compacted surface where pipelines cross existing roads;
- advance identification and flagging of all existing ROWs that would be crossed by proposed pipelines and roads;
- backhoe and hand excavation at pipeline crossings until the exact locations of underground lines have been determined; and
- restoring native vegetation as soon as practical.

To provide additional environmental protection for area residents, the BLM may require that well locations be situated 350 ft or greater distance from residences. Furthermore, the BLM may consult with community and county governments/organizations to obtain input and advise regarding the protection of public health and safety in and proximal to rural residential areas.

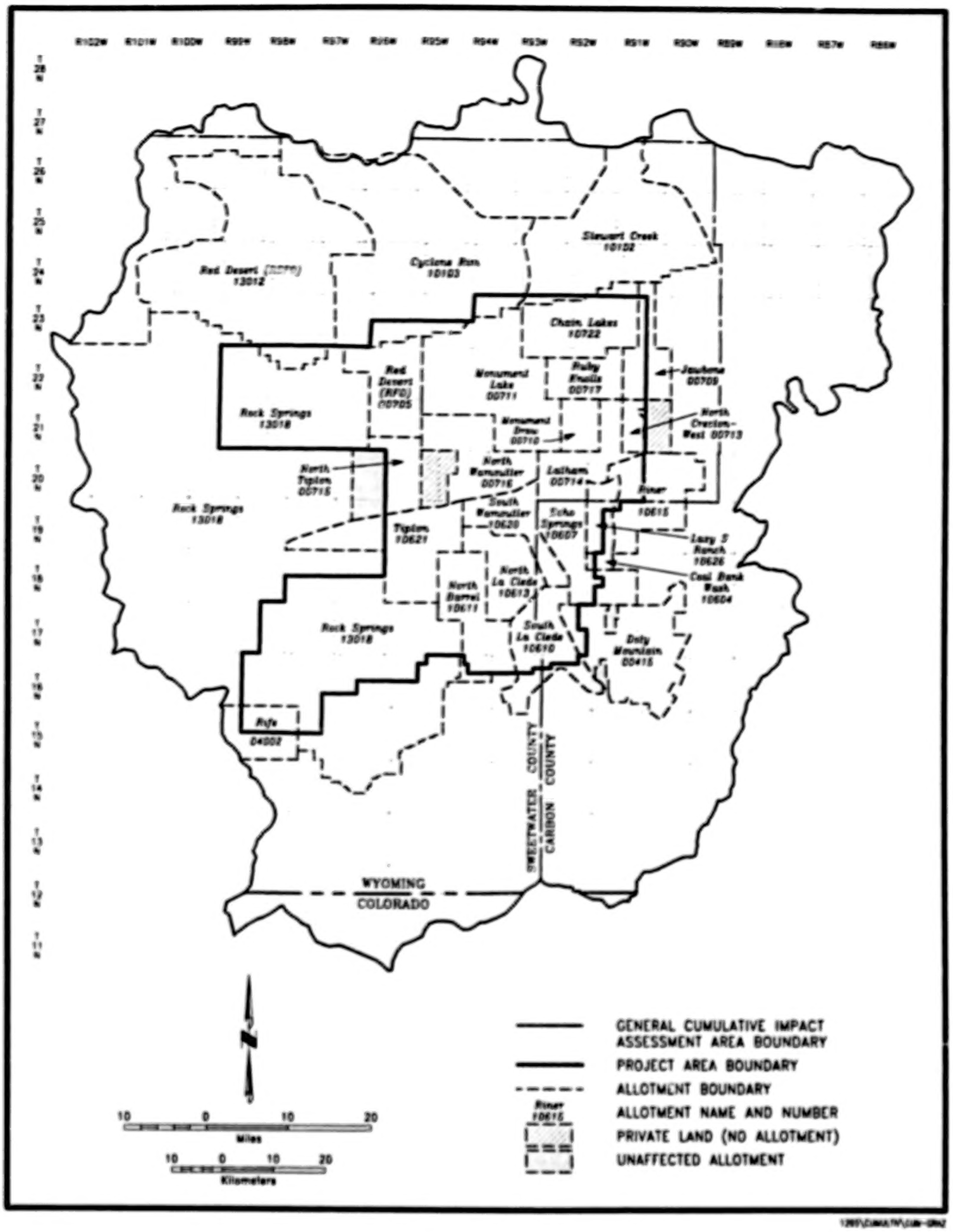
Road signs on the CD/WIIPA may require maintenance and monitoring as deemed appropriate by the BLM, and Operators may be required to conduct all maintenance and monitoring operations to ensure that signs are in proper repair and placed in appropriate locations. Construction monitoring by the BLM may be conducted where proposed pipelines cross existing underground pipeline or cable ROWs on the CD/WIIPA.

All sources of aggregate for construction of well locations and roads and for road improvement and maintenance would be identified by the Operators in TPTSD updates (BLM 1999a). The appropriate surface management agency (usually the State of Wyoming) would approve the sources and times of extraction prior to use.

4.5.6 Cumulative Impacts

Existing, proposed, and potential future land developments on the CD/WIIPA, MCIAA, and GCIAA are presented in Table 4.2. No developments beyond those identified in this table are anticipated. Grazing allotments affected by the proposed project in combination with existing and potential future projects within and adjacent to the CD/WIIPA would not see a reduction in BLM-authorized stocking rates; therefore, cumulative impacts on grazing are anticipated to be insignificant. Map 4.9 presents the location of project-affected BLM grazing allotments on the GCIAA, and Table 4.16 illustrates the extent of existing, proposed, and potential future impacts in these allotments. The maximum percent AUM loss from existing, proposed, and potential future developments in any allotment would be 9.0% in North Creston-West and 6.7% in Tipton. The majority of this loss is existing, and BLM management of all allotments would continue to improve allotment range condition as necessary.

The cumulative impacts analysis area for land status/use is the CD/WIIPA. There are no other existing or reasonably foreseeable developments in the area that are not in conformance with existing land use policies. No appropriate users have been excluded from the area, and none would be as a result of future development. Oil and gas activities would



Map 4.9 Regionally Affected Grazing Allotments, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

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Table 4.16 Acreage of Direct Cumulative Disturbance in Project-affected Grazing Allotments, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

			Direct Impacts						Total AUM Losses	
			Existing[2]		Proposed[3]		Potential Future[4]			
Allotment[1]	Total Allotment Acreage	Total AUMs	Acres	AUMs	Acres	AUMs	Acres	AUMs	AUMs[5]	%[6]
Chain Lakes	62,256	2,805	500	23	940	42	0	0	65	2.3
Coal Bank Wash	7,669	1,053	17	2	20	3	0	0	5	0.5
Cyclone Rim	255,518	24,204	3,500	330	350	33	200	19	382	1.6
Doty Mountain	83,368	10,512	94	12	110	14	100	13	39	0.4
Echo Springs	46,148	5,093	450	49	520	57	100	11	117	2.3
Jawbone	23,128	2,653	100	11	250	29	0	0	40	1.5
Latham	39,913	3,632	1,200	109	680	62	0	9	180	5.0
Lazy YS Ranch	11,773	1,898	120	19	140	23	100	16	58	3.0
Monument Draw	15,417	1,634	200	21	270	29	0	11	61	3.7
Monument Lake	119,437	13,146	1,100	121	1,990	220	0	55	396	3.0
North Barrel	55,920	5,835	200	21	890	93	100	10	124	2.1
North Creston-West	10,871	1,178	800	87	180	20	0	0	107	9.0
North LaClede	41,721	4,410	600	63	700	75	0	0	138	3.1
North Tipton	26,117	2,843	600	65	450	49	0	0	114	4.0
North Wamsutter	56,167	5,962	900	96	940	100	0	21	217	3.6
Red Desert - RFO	46,731	3,793	200	16	780	64	0	0	80	2.1
Red Desert - RSFO	260,584	11,331	1,400	61	140	6	200	9	76	0.7
Rife	44,753	2,995	100	7	230	15	100	7	29	1.0
Riner	57,075	8,257	1,900	275	180	26	100	14	315	3.8
Rock Springs	2,029,319	232,149	32,700	3,759	5,200	600	7,900	908	5,267	2.3
Ruby Knolls	30,166	2,744	300	27	500	45	0	0	72	2.6
South LaClede	53,831	6,408	530	64	620	74	100	12	150	2.3
South Red Desert	10,366	1,680	150	25	180	29	0	0	54	3.2
South Wamsutter	31,020	2,648	450	38	520	44	0	0	82	3.1
Stewart Creek	188,991	9,648	1,700	87	70	4	200	10	101	1.0
Tipton	60,679	9,535	3,400	531	700	110	0	0	641	6.7

[1] See Map 4.9 for locations.
[2] Includes all existing disturbance in the GCIAA in each affected allotment.
[3] LOP surface disturbance required for the Continental Divide/Wamsutter II Natural Gas Project.
[4] Disturbance from regionally proposed developments in the GCIAA.
[5] Total AUMs lost from existing, proposed (LOP), and potential future developments in affected allotments.
[6] Percent of AUMs lost in affected allotments.

become a more prevalent land use in the area; however, these activities would not preclude other land uses (i.e., livestock grazing, wildlife, and recreation) and multiple use would continue. Thus, cumulative impacts would be insignificant. In the long-term, after the LOP, use of the areas required for oil and gas production would return to livestock grazing, wildlife, and recreation.

The cumulative impacts area for recreation is the GCIAA area. Past and present developments have included road construction, which has allowed increased access to the area. Impacts from any of the action alternatives and from reasonably foreseeable development would limit some recreational users (i.e., those seeking solitude and hunters that, for safety reasons, would avoid areas immediately adjacent to project facilities). Recreationists preferring motorized travel would benefit from the increase in roads, whereas those preferring a more primitive area would find the area less desirable. Adequate remote undeveloped recreation sites exist in the WSAs proximal to the CD/WIIPA; therefore, cumulative impacts for most recreationists are projected to be insignificant.

During the drilling and construction phase, noise, dust, traffic, the presence of equipment, and associated human activities would change the existing character of some remote areas in the CD/WIIPA. This may diminish the quality of some recreational experiences, such as backcountry hiking and camping, wild horse and wildlife observation, horseback riding, nature photography, big game hunting, and ORV use. Once drilling and construction have been completed and equipment and human activity are reduced to levels necessary for production, cumulative impacts to recreation would likely not be significant for most users. Wildlife and wild horses would continue to use the area and would, for the most part, adapt to changes brought about by construction. With improved access, poaching and disturbance of big game may increase. In addition, areas proximal to well locations and other facilities may be avoided by some hunters, which may negatively affect some hunter recreational experiences. However, increased accessibility throughout the CD/WIIPA would enhance opportunities for hunting and wildlife and wild horse observation for other recreational users.

Cumulative impacts from traffic resulting from the proposed project in combination with existing and potential future action are not anticipated to be significant. The project would likely be the major contributor to increased traffic on secondary roads within the CD/WIIPA. Developments would result in increased traffic volumes on major highways and county and local roads. However, the magnitude of the increase would depend on how much development actually takes place, as well as the pace of that development. Existing major highways and county roads are adequate to handle anticipated increased traffic, but it is uncertain whether major roadway improvements would be necessary. The costs of maintaining county and local roads would be borne, to some extent, by developers, either directly or through tax payments. Cumulative impacts on transportation are anticipated to be slightly beneficial for both the short- and long-term as an increase in available roads and road conditions occurs. Some roads may be retained upon project completion allowing increased recreational use of the area. However, adverse permanent impacts are expected to be insignificant. Roads built on private lands that do not meet BLM road construction guidelines may result in augmented transportation impacts due to potential road failures.

Proposed developments in the CD/WIIPA in combination with other current and future development projects in the region would increase demands for and impacts on recreational resources. Operation of the field would have a minimal cumulative impact due to the relatively small number of people involved in production activities (Table 2.3), coupled with the large size of the CD/WIIPA.

Overall, cumulative impacts to land uses within the CD/WIIPA and adjacent areas would be similar to those described for the Proposed Action, since similar mitigation measures would be applied on all potential future projects.

4.6 AESTHETICS AND VISUAL RESOURCES

The BLM GDRA and GRRA RMPs (BLM 1990a, 1997a) and state (WSLUC 1979) and local (THK 1977; UW 1991; Pedersen Planning Consultants 1997, 1998) land use plans address the following management objectives associated with aesthetics and visual resources:

- to maintain or improve scenic values and visual quality and to establish priorities for managing the visual resources in conjunction with other resource values;
- to minimize adverse effects on visual resources while maintaining the effectiveness of land use allocations;
- to maintain or improve the quality of air, water, and land resources;
- to conserve and develop scenic resources for the benefit of present and future generations;
- to minimize emissions which may add to acid rain, may cause violations of air quality standards, or may reduce visibility;
- to maintain and, where possible, enhance present air quality levels; and
- to protect public health and safety and sensitive natural resources.

The following analysis shows that the Proposed Action and alternatives are generally compatible with these management objectives; however, significant impacts could occur in VRM Class II areas if well locations are situated on an 80-acre spacing pattern.

4.6.1 Proposed Action

No surface disturbance would occur in VRM Class I lands, and it is unlikely that project facilities would impact viewsheds from the Class I areas located south of the CD/WIIPA. Approximately 470 acres of initial surface disturbance and 174 acres of LOP surface disturbance would occur in VRM Class II areas (Table 4.17). Because well locations in some areas may be situated on an 80-acre spacing pattern, several well locations could be viewed simultaneously, and if this well location density occurred in VRM Class II areas, this would represent a significant change in landscape character.

An estimated 3,436 acres LOP surface of disturbance would occur in VRM Class III areas which allow for moderate alteration of the natural landscape character, provided the action does not dominate the view of a casual observer. Because of the wide vistas available in the CD/WIIPA, well locations are not likely to dominate any single field of view, and thus, impacts in VRM Class III areas would not be significant. Approximately 4,690 acres of LOP surface disturbance would be located in VRM Class IV areas, where the change to the characteristic landscape can be high. The Proposed Action would be consistent with the management goals for VRM Class III and IV areas; impacts to visual resources in Class III and IV areas are not anticipated to be significant for the LOP and beyond.

While the VRM Class III and IV areas allow for development, the aesthetic character of remote locations would be reduced in some areas by the proposed development. The impact likely would not affect casual observers but likely would affect recreational users who target these more remote areas. Because few people use these areas and development in these areas is consistent with BLM management guidelines, impacts would not be significant. Furthermore, upon project completion, most visual signs of the project would be removed, most disturbed areas would be revegetated, and most roads would be reclaimed; therefore, permanent impacts to visual resources would be consistent with VRM management goals.

4.6.2 Alternative A

While the extent of new surface disturbance under Alternative A could be the same as that of the Proposed Action, surface disturbance on federal lands in VRM Class II areas would likely be reduced; VRM Class II areas are included in SRAs and maximum long-term surface disturbance in these areas would be limited (see Table 2.2). Some additional disturbance on private lands on VRM Class II areas could occur under this alternative. No significant impacts to visual resources are anticipated to occur under Alternative A.

4.6.3 Alternative B

While the extent of new surface disturbance under Alternative B could be the same as that of the Proposed Action, surface disturbance on federal lands in VRM Class II areas would likely be reduced; VRM Class II areas are included in SRAs and maximum long-term surface disturbance in these areas would be limited (see Table 2.2). Some additional disturbance on private lands in VRM Class II areas could occur under this alternative. No significant impacts to visual resources are anticipated to occur under Alternative B. Visual resource impacts under

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Table 4.17 Acreage of Surface Disturbance in Visual Resource Management Areas, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

					Disturbance					
	CD/WIIPA		GCIAA		Existing				Total	
VRM Class	Acres	%	Acres	%	CD/WIIPA	GCIAA[1]	Proposed[2]	Potential Future	Acres[3]	%[4]
Class I	0	0	51,300	1.1	0	700	0	50	750	1.5
Class II	22,600	2.1	308,600	6.9	186	1,100	174	190	1,464	0.5
Class III	439,100	41.4	2,299,800	51.2	6,128	45,600	3,436	6,570	55,606	2.4
Class IV	599,500	56.5	1,692,100	37.7	8,486	35,000	4,690	5,040	44,730	2.6
Rehabilitation areas	0	0	138,200	3.1	0	3,700	0	50	3,750	2.7

[1] Includes disturbances within the CD/WIIPA.

[2] Includes new LOP disturbance (excludes existing disturbance required for the Proposed Action, which is included in existing CD/WIIPA disturbance column).

[3] Includes all existing, proposed (LOP), and potential future surface disturbance within each VRM class in the GCIAA.

[4] Percent of each VRM Class on the GCIAA disturbed from existing, proposed (LOP), and potential future actions.

Alternative B would likely be intermediate between those of Alternative A and the Proposed Action.

4.6.4 No Action

Under the No Action Alternative, impacts to visual resources would continue at existing authorized levels. However, impacts to visual resources under this alternative could be increased from those of the Proposed Action and Alternatives A and B due to the absence of coordinated reclamation and transportation planning efforts (see Appendices A and B). Under the No Action Alternative, it is anticipated that new disturbance (6,400 acres) in VRM Class II, III, and IV areas would be 100 acres, 2,600 acres, and 3,700 acres, respectively. Long-term disturbance (2,400 acres) in the CD/WIIPA occurring under the No Action Alternative would be 50 acres, 1,000 acres, and 1,350 acres in VRM Class II, III, and IV, respectively. In the absence of further development, visual resource characteristics in each of the VRM Class areas would remain unchanged from those existing today.

4.6.5 Mitigation and Monitoring

4.6.5.1 Applicant-Committed Measures

- Operators would utilize existing topography to screen roads, pipeline corridors, drill rigs, wells, and production facilities from view where possible.
- Operators would paint all above-ground production facilities with appropriate colors (e.g., Carlsbad Canyon or Desert Brown) to blend with the adjacent terrain, except for structures that require safety coloration in accordance with OSHA requirements.

4.6.5.2 Additional Potential BLM-Required Mitigation

During on-site reviews, the BLM and the Operators would evaluate potential disturbances to visual resources and identify appropriate mitigations. Appropriate mitigation may be required to minimize contrast within the CD/WIIPA, making wells, roads, pipelines, and ancillary facilities less noticeable during the LOP. Well locations, roads, pipelines, and other linear intrusions could be located and designed to blend with topographic features, thereby reducing the visual contrast between these features and the natural elements of the surrounding landscape. Additionally, portions of well locations not used during production, pipeline corridors, and other disturbed sites would be reclaimed and revegetated, as soon as practicable. Revegetation would be initiated as soon as possible after disturbance. Pipeline ROWs could be located within existing ROWs. Project scheduling and traffic control procedures may also be employed as deemed appropriate by the BLM to further reduce visual impacts.

4.6.6 Cumulative Impacts

The cumulative impacts analysis area for visual resources is the GCIAA and affected VRM Class areas (see Table 4.1 and Map 3.16). VRM Class I areas comprise 1.1% of the GCIAA, Class II - 6.9%, Class III - 51.2%, Class IV - 37.7%, and rehabilitation areas - 3.1%. No impacts from the proposed project would occur in either VRM Class I or rehabilitation areas; therefore, there would be no increased impacts in these areas resulting from the project.

The greatest impact to visual resources resulting from the proposed project in combination with past and potential future actions would likely occur in VRM Class II areas. It is anticipated that approximately 1,464 acres of cumulative long-term surface disturbance could occur in these areas (see Table 4.17), and as with the Proposed Action, if disturbances are concentrated in any particular field of view, impacts could be significant. However, only about 0.5% of all VRM Class II areas within the GCIAA would be cumulatively impacted, and the majority of this cumulative disturbance is existing (1,100 acres) (Table 4.17). Therefore considerable acreage of pristine viewsheds would remain available.

Cumulative long-term disturbance in Class III areas would approximate 55,606 acres, 2.4% of GCIAA Class III areas. Eighty-two percent of the GCIAA Class III disturbance is existing (45,600 acres) (see Table 4.16). Further, if this project is implemented under either Alternative A or B, cumulative impacts to VRM Class II areas are anticipated to be insignificant.

The VRM objectives of Class III and Class IV, the predominant visual classes in the GCIAA, are to: partially retain the existing character of the landscape (Class III); or major modifications of the existing character of the landscape may occur (Class IV). Neither past developments, the Continental Divide/Wamsutter II Project nor reasonably foreseeable development would introduce activities or visual qualities incompatible with Class III or Class IV areas; therefore, cumulative impacts are not anticipated to be significant in these areas.

Significant cumulative impacts would be expected to occur if new well locations or other developments are situated such that they dominate views within VRM Class II areas. Eight wells per section would likely dominate the field of view of a casual observer in some areas, and, if that estimation were to occur, would violate the objectives of VRM Class II areas.

4.7 HAZARDOUS MATERIALS

The BLM GDRA and GRRA RMPs (BLM 1990a, 1997a) and state (WSLUC 1979) and local (THK 1977; UW 1991; Pedersen Planning Consultants 1997, 1998) land use plans address the following management objectives associated with hazardous materials:

- to protect public and environmental health and safety on BLM-administered public lands;
- to comply with applicable federal and state laws;
- to provide for the disposition of solid waste to protect the environment from degradation and scenic resources from unsightly litter;
- to minimize federal exposure to the liabilities associated with waste management on public lands;
- to integrate hazardous materials and waste management policies and controls into all BLM programs;
- to minimize emissions which may add to acid rain, cause violations of air quality standards, or reduce visibility;

- to maintain and, where possible, enhance present air quality levels; and
- to protect public health and safety and sensitive natural resources.

The following analysis shows that the Proposed Action and alternatives are compatible with these management objectives, and no significant impacts are anticipated.

4.7.1 Proposed Action

Impacts to soils, surface and ground water resources, and wildlife could result from accidental hazardous material spills and/or exposure of these materials to wildlife. Any spills would be cleaned up and the contaminated soils disposed of or rehabilitated as specified in the Operator provided SPCC Plans and the Hazardous Material Summary for this project (BLM 1998c). Since potentially contaminated soils would be remediated in a timely manner, only insignificant soil impacts from accidental spills are anticipated. Proper containment of oil, fuel, and other fluids in storage areas, containment of fluids in reserve pits, and location of wells away from drainages would limit potential surface and ground water contamination to insignificant levels. If nongame and small mammals are attracted to and use any of the reserve pits or other localities that contain potentially harmful substances, appropriate measures to restrict access (e.g., netting, pool covers) would be employed to assure that impacts to wildlife are minimized and remain insignificant for the LOP. All reserve pits would be fenced and netted as deemed appropriate by the BLM.

Since project operations would comply with the directives identified in the Hazardous Material Summary for this project (BLM 1998c) and SPCC Plans, no significant impacts are anticipated.

4.7.2 Alternative A

The potential for hazardous material impacts under Alternative A would be the same as that of the Proposed Action.

4.7.3 Alternative B

The potential for hazardous material impacts under Alternative B would be the same as that of the Proposed Action.

4.7.4 No Action

Under the No Action Alternative, potential impacts from hazardous materials would remain at existing levels, since materials would be produced, used, stored, transported, or disposed of as currently authorized.

4.7.5 Mitigation and Monitoring

4.7.5.1 Applicant-Committed Measures

- Operators would utilize WDEQ-approved portable sanitation facilities at drill sites.
- Operators would place warning signs near potentially hazardous areas (e.g., well locations, ancillary facilities) and along roadways.
- Operators would place appropriate dumpsters at each construction site to collect and store garbage and refuse.
- Operators would ensure that all refuse and garbage is transported to a State of Wyoming-approved sanitary landfill for disposal.
- Each operator would institute a Hazard Communication Program for its employees and would require subcontractor programs in accordance with OSHA (29 C.F.R. 1910.1200).
- Operators would keep on file, at the field office, a MSDS for every chemical or hazardous material that is brought on-site in accordance with 29 C.F.R. 1910.1200.
- SPCC Plans would be written and implemented, where applicable, in accordance with 40 C.F.R. 112.
- Chemical and hazardous materials would be inventoried and reported in accordance with the SARA Title III (40 C.F.R. 335). If

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quantities exceeding 10,000 pounds or TPQ are to be produced or stored, the appropriate Section 311 and 312 forms would be submitted at the required times to the State and County Emergency Management Coordinators and the local fire departments.

- Any hazardous wastes, as defined by RCRA, would be transported and/or disposed of in accordance with all applicable federal, state, and local regulations.

4.7.5.2 Additional Potential BLM-Required Mitigations

Operators and their contractors/subcontractors would comply with all applicable hazardous material laws and regulations and would locate, handle, and store hazardous substances in an appropriate manner to prevent them from contaminating area resources.

The BLM may require all storage tank batteries, drain sumps, and sludge holdings at compressor facilities installed on location and designed to contain any oil, glycol, produced water, or other fluid which may constitute a hazard to public health or safety to be surrounded by a secondary means of containment for the entire contents of the largest single tank in use plus 1 ft of freeboard for precipitation or 110% of the capacity of the largest vessel. The appropriate containment and/or diversionary structures or equipment, including walls and floor, to prevent discharged fluid from reaching ground water, surface water, or navigable waters, would be sufficiently impervious to any oil, glycol, produced water, or other fluid for 72 hrs and would be constructed so that any discharge from a primary containment system, such as a tank or pipe, would not drain, infiltrate, or otherwise escape to ground water, surface water, or navigable waters before cleanup is completed.

The BLM also may require treaters, dehydrators, and other production facilities installed on location that have the potential to leak or spill oil, glycol, produced water, or other fluid which may constitute a hazard to public health or safety to be placed on or within appropriate containment and/or diversionary structures to prevent spilled or leaking fluid from reaching ground water, surface water, or navigable waters. The appropriate containment and/or diversionary structure would be sufficiently impervious to oil, glycol, produced water, or other fluid and would be installed so that any spill or leakage would not drain, infiltrate, or otherwise escape to ground water, surface water, or navigable waters before cleanup is completed.

Notice of any spill or leakage, as defined in BLM NTL 3A, would be immediately reported by the Operator to the BLM and other federal and state officials (e.g., WDEQ) as required by law. Incidents requiring verbal notification by regulation would be given as soon as possible, but no later than 24 hrs after the discovery of the incident. Verbal notification would be confirmed in writing within 15 days or other such time required by the appropriate regulatory agency. Any release of hazardous substances (leaks, spills, etc.) in excess of the reportable quantity as established by 40 C.F.R. 117 would be reported as required by CERCLA (42 U.S.C. 9601 et seq.). If the release of a hazardous substance in a reportable quantity does occur, a copy of the report would be furnished to the BLM and all other appropriate federal and state agencies.

Each Operator would also prepare and implement, as necessary, the following plans and/or policies:

- pursuant to 40 C.F.R. 112, SPCC Plans prepared for those sites where SPCC Plans apply;
- Spill Response Plans (oil/condensate);
- plans and inventories of hazardous chemical categories pursuant to Section 312 of SARA, as amended; and
- Emergency Response Plans.

Copies of the plans/policies would be maintained with the Operators, as required by regulation and would be made available for review upon request.

The Operators would prepare for the WDEQ-WQD SWPPPs for activities requiring disturbances of greater than 5 acres. These plans would identify best management practices including erosion and pollution control procedures that would be implemented throughout the LOP to minimize pollution of surface waters.

Hazardous materials used, produced, transported, stored, and disposed of for this project would be in accordance with all federal and state rules and regulations, applicable SWPPPs and SPCC Plans, and the Hazardous Materials Summary for this project (BLM 1998c). This summary is available for review at the BLM RFO and the RSFO.

Any hazardous material spills would be handled as specified in Operator-provided and BLM-approved SPCC Plans and the Hazardous Material Summary for this project (BLM 1998c). Operators would be responsible for reporting spills of hazardous materials and implementing applicable procedures, monitoring, and reporting requirements.

All garbage and refuse would be hauled to state-approved sanitary landfills or other disposal sites. Operators would store garbage and refuse materials collected on site in containers prior to transport.

4.7.6 Cumulative Impacts

All the proposed regional development projects would use mitigation measures similar to or more stringent than those described for the Proposed Action to prevent soil contamination, surface and ground water pollution, and wildlife exposure; therefore, cumulative impacts from hazardous materials are expected to not be significant.

4.8 UNAVOIDABLE ADVERSE EFFECTS

The mitigation measures incorporated in the project description, and identified herein, would avoid or minimize many of the potential adverse effects; however, not all adverse effects can be avoided, nor is mitigation 100% effective in remediating all impacts. There would be at least a minimal amount of unavoidable adverse effect on all resources present in the CD/WIIPA for at least a short time, due to the presence of equipment and humans in the area and the time necessary for mitigation to be effective (e.g., reclamation). Potential significant unavoidable adverse impacts from the Proposed Action are: depletion of natural gas and condensate reserves from the CD/WIIPA; loss of PFC in area drainages; reactivation of stabilized sand dunes; noise and other indirect impacts at sensitive sites (i.e., residences, crucial wildlife habitats during critical periods) during construction, drilling, completion/testing, and workover operations; and visual resource impacts in VRM Class II areas. Under Alternatives A and B, potentially significant unavoidable adverse impacts would be limited to the depletion of natural gas and condensate reserves and loss of PFC in area drainages.

Some increase in air pollutant emissions would occur in the CD/WIIPA as a result of the Proposed Action and alternatives; however, these impacts are predicted to be below applicable significance thresholds.

4.9 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

An irreversible and irretrievable impact is defined as a permanent reduction or loss of a resource that once lost cannot be regained. The primary irreversible and irretrievable commitment of resources from the proposed project would result from removal and use of the gas and oil reserves and aggregates for road and well location construction and maintenance. The soil lost through wind and water erosion would also be an irreversible and irretrievable loss from the CD/WIIPA. Water produced prior to and during gas production would eventually be replaced as the aquifers recharge from surface infiltration in recharge areas.

Once natural gas development activities are complete, all related direct air quality impacts would cease, and the atmosphere would cleanse itself. However, to the extent other regional air pollutant emission sources remain, future background air quality conditions may remain more polluted than described in Section 3.1.2 (Air Quality).

The loss of productivity (i.e., forage, wildlife habitat) from lands devoted to project activities (i.e., well locations, roads) would be an irreversible and irretrievable commitment during the time that those lands are out of production and until they are revegetated. Most of the land would be returned to production after reclamation and revegetation; however, the vegetation community may take more than 20 years after the LOP to recover.

Inadvertent or accidental destruction of paleontological or cultural resources during construction would be an irreversible and irretrievable loss, but it is not likely to be a significant impact since archaeological and paleontological data recovery and monitoring activities would be conducted as deemed appropriate by the BLM.

Animals killed during earthmoving activities or through collisions with vehicles are irreversibly and irretrievably lost. Impacts associated with this loss would be negligible.

There would be an irreversible and irretrievable commitment of the energy and some materials used during construction, drilling, production, and reclamation associated with the project. Pipelines and materials used for casing and cementing wells would be permanent and would be abandoned in place. They would not be recovered due to practical or economic considerations, so they would be irreversibly and irretrievably committed.

4.10 SHORT-TERM USE OF THE ENVIRONMENT VS. LONG-TERM PRODUCTIVITY

For purposes of this discussion, short-term use of the environment is that use during the LOP, and long-term productivity refers to the period after the project is completed and the area reclaimed. The short-term use of the environment would affect the resources as discussed in Sections 4.1 through 4.7 above. This use and associated impacts would not significantly affect the long-term productivity of the CD/WIIPA or adjacent areas. After the project is completed and disturbed areas reclaimed, the same resources that were present prior to the project would be available, except for the oil, gas, and aggregates that were removed. It may take 20 years or more after the LOP for some of the reclaimed areas to revegetate to conditions similar to those present prior to disturbance (e.g., shrub replacement); however, reclamation would provide conditions to support wildlife, livestock, and recreation soon after project completion. Use of the CD/WIIPA during the LOP would not preclude the subsequent long-term use of the area for any purpose for which it was originally suited prior to the project.

5.0 CONSULTATION AND PREPARERS

Personnel contacted or consulted during preparation of this EIS are listed in Table 5.1. The list of preparers and participants is given in Table 5.2.

Table 5.1 Personnel Contacted or Consulted, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Agency or Organization	Individual	Position
Abraxas Petroleum Corporation	Robert Patterson	--
Amoco Production Company	Doug N. Blewitt	Certified Consulting Meteorologist\Air Programs Coordinator
	Kristen Holden	Field Environmental Coordinator
	Jan Rutty	Environmental Affairs Specialist
	Dehn Solomon	Consultant
	Kirk Steinle	Environmental Affairs Specialist
	Gary Sundberg	Wamsutter Operations Center
Apache Corporation	Gary Carson	--
	Mike Fitzgerald	--
Black Butte Mine	Don Wales	--
Brown-Buntin Associates, Inc.	Paul Bollard	Noise Specialist
Bureau of Land Management		
Casper Field Office	Fred Crockett	Geologist
	Roger Miller	Geohydrolgist
	Asghar Shariff	Chief, Reservoir Management
Lander Field Office	Fred Georgeson	Geologist
	Jack Kelly	Field Manager
Little Snake River Resource Area	John Husband	Field Manager
National Applied Resource Sciences Center (Denver)	Scott Archer	Senior Air Resource Specialist

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Table 5.1 (Continued)

Agency or Organization	Individual	Position
Rawlins Field Office	Larry Apple	Wildlife Biologist
	Mary Apple	Public Affairs
	Frank Blomquist	Rangeland Management Specialist
	Shirley Bye-Jech	Outdoor Recreation Planner
	Mike Calton	Rangeland Management Specialist
	Dennis Carpenter	Support Services Manager
	Krystal Clair	Outdoor Recreation Planner
	Missy Cook	Technical Support
	Sarah Crocker	Rangeland Management Specialist
	Susan Foley	Soil Scientist
	Walter George	Special Projects Coordinator
	Ken Henke	Natural Resource Specialist
	Larry Jackson	Natural Resource Specialist
	Mike Jensen	Engineer
	Mick Kaser	Realty Specialist
	Larry Kmoch	Solid Minerals Chief
	Kurt Kotter	Field Manager
	Lynn McCarthy	GIS Coordinator
	Sandra Meyers	Cultural Resource Specialist
	Clare Miller	Environmental Scientist
	Mark Newman	Geologist
	Chris Otto	Rangeland Management Specialist
	Ken Peacock	Hydrologist
	Kip Purinton	Petroleum Engineer
	Mary Read	Wildlife Biologist
	Chuck Reed	Range Resource Specialist
	Marilyn Roth	Realty Specialist
	John Spehar	Environmental Specialist
	Karla Swanson	Area Manager
	Brenda Vosika	Mining Engineer
	Ann Watson	Fishery Biologist

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Table 5.1 (Continued)

Agency or Organization	Individual	Position
Rock Springs Field Office	Barbara Amidon	Botanist
	Rick Amidon	Wildlife Biologist
	Teresa Deakins	Environmental Protection Specialist
	Jon Dolak	Environmental Protection
	Dennis Doncaster	Hydrologist
	James Dunder	Wildlife Biologist
	Patricia Hamilton	Realty Specialist
	Sally Haverly	Realty Specialist
	John Henderson	Fisheries Biologist
	Don Judice	Petroleum Engineer
	Bill LeBarron	Manager
	Joseph Lujan	Wildlife Biologist
	John MacDonald	Soil Scientist/Air Resource Contact
	Stan McKee	Field Manager
	Bill McMahan	Environmental Coordinator
	Ted Murphy	Mineral Specialist
	Jim Perkins	Rangeland Management Specialist
	Elaine Raper	Wildlife Biologist
	George Schoenfeld	Natural Resource Specialist
	Don Schramm	Transportation Specialist
	Jeff Shawn	Air Resource Specialist
	Thor Stephenson	Wild Horse, Range Management Specialist
	Wayne Sutherland	Geologist
	Russ Tanner	Cultural Resource Specialist
	Andy Tenney	Recreation Planner
	David Valenzuela	Geologist
	Pat Wendt	Assistant Manager
	Bernie Weynand	Acting Manager
	Allen White	Hazardous Materials Specialist
Wyoming State Office, Cheyenne	Laurie Bryant	Paleontologist
	Susan Caplan	Air Resource Specialist
	Jeff Carrol	Sensitive Species Specialist
	Bill Daniels	Resource Policy and Management
	Vickie Daniels	Environmental Scientist
	Tom Enright	Environmental Coordinator
	Ron Hilton	Environmental Scientist
	Jon Johnson	Environmental Protection Specialist
	Pamela Lewis	Supervisory Land Law Examiner
	Patrick Madigan	Supervisory Cartographer
	Michael Madrid	Supervisory Petroleum Engineer
	Gretchen Meyer	Natural Resource Specialist
	Larry Neasloney	GIS Specialist
	Joe Patti	Natural Resource Specialist
	Diane Roberts	--
	Rick Schuler	Natural Resource Specialist
	Dennis Stenger	Supervisory Geologist
	Roger Wickstrom	Natural Resource Specialist

Table 5.1 (Continued)

Agency or Organization	Individual	Position
Carbot Oil and Gas Corporation	Terry Jackson	--
Carbon County, Wyoming	Cindy Baldwin	County Treasurer
Chicago Field Museum of Natural History	John J. Flynn	Paleontologist
City of Wamsutter	Susan Carnes	Town Clerk/Treasurer
Coastal Oil and Gas Corporation	Bonnie Carson	Environmental Analyst
	Bonnie Johnston	Environmental Analyst
Colorado Department of Public Health and Environment, Air Pollution Control Division	Coleen Campbell	Environmental Scientist
	Dan Ely	Research Specialist
Colorado Division of Wildlife	Brad Petch	Wildlife Manager, Maybell District
Colorado Interstate Gas Company	Sheila Bremer	--
	Floyd Robertson	--
Department of the Army, U.S. Corps of Engineers, Omaha District	Matthew A. Bilodeau	Program Manager
	Thomas B. Johnson	Project Manager, Cheyenne Regulatory Office
	Robert S. Nebel	Chief, Environmental Analysis Branch, Planning Division
	Chandler J. Peter	Program Manager
	Candace M. Thomas	Chief, Environmental Analysis Branch, Planning Division
Earth Tech, Inc.	Alice Kashmanian	Office Manager
	Robert O'Neal	Certified Consulting Meteorologist/ Program Director
	Francoise Robe	Air Quality Specialist
	Joseph S. Scire	Certified Consulting Meteorologist/Vice President
Eastern Shoshone Tribe	John Tarnesse	Tribe Spiritual Representative
Enron Oil and Gas	Andrew Morris	--
ERA Saulcy Land Company, Inc.	Andrea Shephard	--
Green River/Rock Springs Joint Powers Water Board	Deanna Holloway	Administrative Assistant
Harding Lawson Associates	John Bebbington	Associate Engineer
	Robert Zimmer	Environmental Scientist
Holson Environmental Planning	Gary Holson	Environmental Scientist
Hunt Oil Company	Chuck Williams	--

Table 5.1 (Continued)

Agency or Organization	Individual	Position
Individuals	Colleen Aimone	Citizen
	Martin Aimone	Citizen
	Leo Benson	Citizen
	Rosemary Benson	Citizen
	Terry L. Binger	Landowner
	Donald Dixon	Citizen
	Mary Dixon	Citizen
	Jerry Faddis	Citizen
	Norman Gillespie	Citizen
	Earl J. Gorman	Landowner
	Diana Jones	Citizen
	Ruth M. Lamp	Landowner
	Julia Ravia	Citizen
	Noah Ravia	Citizen
	Curtis Rochelle	Landowner
	Randall Taylor	Citizen
	John G. Vierra	Landowner
	Steve Wolmer	Soil Scientist
	William Yates	Citizen
Lario Oil and Gas	Alex Campbell	Landman
	Duane Haley	--
Kaiser-Francis Oil Company	Dennis Vrooman	--
Marathon Oil Company	Randy Meabon	--
Mountain Gas Resources, Inc.	M. Sue Park	Landman
National Wildlife Federation	Susan Morath Horner	Staff Attorney
North American Resource Company	Joni Driscoll	--
	Henry Errebo	--
Norwest Bank Company	James W. Price	Vice President
Prenalta Corporation	David W. Klym	Vice President
Presidio Exploration, Inc.	Ed Kerr	--
Rocky Mountain Casing Crews, Inc.	Salley Pedersen	Secretary
R.P. Oilfield Service Inc.	Rodney Petersen	--
Samedan Oil Corporation	Scott Steinke	--
Shoshone and Northern Arapaho Tribes	Don Arragon	Director
Sierra Club Legal Defense Fund	Debra Asimus	--
	Robert Wiygul	--
Snyder Oil Corporation	Deven K. Delap	District Superintendent
	Tim Morris	Land Manager
Sprint	Howard Duff	OSP Engineer

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Table 5.1 (Continued)

Agency or Organization	Individual	Position
Sweetwater County		
Planning and Zoning	Mark Kot	Sweetwater County Planner
	Chuck Radosevich	Engineer
Treasurer's Office	Sue Sanchez	Chief Deputy County Treasurer
Tigner Consulting	Bob Tigner	Wildlife Biologist
Tom Brown Inc.	Mona Binion	--
Uintah Engineering and Land Surveying	Harold Marshall	Civil Engineer
	Nelson Marshall	Civil Engineer
	David Weston	Civil Engineer
Union Pacific Resources Company	Mark Bacon	General Manager
	Bill Brazelton	Senior Regulatory Analyst
	Mark Conrad	Petroleum Engineer
	Vicky Guennewig	--
	Jim LaFevers	Natural Resource Supervisor
	Dave Petrie	Natural Resource Supervisor
	John Rector	Natural Resource Supervisor
	Joy Rector	Senior Regulatory Analyst
University of Wyoming		
Botany Department	Ken Driese	Research Assistant
	William Reiners	Department Head
Geology Museum	Brent Breithaupt	Museum Curator/Paleontologist
Wyoming Water Resources Center	Jeff Hammerlinck	GIS Coordinator
	Debbie Yates	Data Specialist
U.S. Bureau of Reclamation	John Lawson	Field Manager
U.S. Department of Agriculture, Forest Service	Clif Benoit	Air Quality Specialist
	Tamara Blett	Air Quality Specialist
	Elizabeth Estill	Regional Forester
	Laura Hudnell	Soils Scientist
	Linda A. Joyce	Atmospheric Deposition Project Leader
	Ann Mebane	Air Quality Specialist
U.S. Department of Interior, National Park Service, Air Quality Division	Erik Hague	Environmental Specialist
U.S. Environmental Protection Agency (Region VIII)	Robert Edgar	Air Quality Specialist
	J. William Geise, Jr.	Acting Chief, Environmental Assessment Branch, Water Management Division
	Michael J. Strieby	Environmental Scientist

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Table 5.1 (Continued)

Agency or Organization	Individual	Position
U.S. Fish and Wildlife Service	Charles P. Davis	State Director, Cheyenne
	Pat Diebert	Biologist
	Dave Felley	Biologist
	Mary Jennings	Wildlife Biologist
	Mike Jennings	Wildlife Biologist
	Brad Rogers	--
	Jane Roybal	Biologist
Western Gas Resources	Sue Park	--
Wildlife Management Institute	Len Carpenter	Field Representative
Williams Field Services	Diane Casalena	--
	Rob Hawksworth	--
	Rory Miller	--
	Larry Watson	--
Wind River Multiple Use Advocates	William G. King	Secretary
Wyoming Department of Employment Research and Planning	Gordon Wolford	Statistician
Wyoming Department of Environmental Quality, Air Quality Division	Bernie Dailey	Engineering Supervisor/Program Manager
	Diana Grant	District Engineer
	Darla J. Potter	Senior Analyst
Wyoming Department of Revenue	Don Bright	--
	Ed Schmitt	Administrator, Mineral Tax Division
Wyoming Department of Transportation	John Lane	Highway Engineer
	Jim Monturro	Highway Engineer
	Adam Uhrich	Transportation Survey Supervisor
Wyoming Division of Economic Analyses	Wenlin Liu	Economist
Wyoming Game and Fish Department	Benge Brown	West Rawlins Game Warden
	Victoria Campbell	MIS Specialist
	Andrea Cerovski	Nongame Bird Biologist
	Pat Deibert	Environmental Biologist
	Bill Gerhart	Assistant Supervisor, Habitat Branch
	Greg Hiatt	Wildlife Biologist
	Pat Hnilicka	Wildlife Biologist
	Bob Luce	Nongame Mammal Biologist
	Joe Nemick	Wildlife Management Coordinator
	Kerry Olson	Wildlife Biologist
	Reg Rothwell	Staff Biologist
	Bill Rudd	Wildlife Management Coordinator
	Lara Sweeney	Wildlife Biologist
	Joe White	Deputy Director
	Bill Wichers	Deputy Director
	Mark Zornes	Wildlife Biologist

Table 5.1 (Continued)

Agency or Organization	Individual	Position
Wyoming Highway Patrol	Sgt. M.L. Johnson	Sergeant
Wyoming Natural Diversity Database	Walt Fertig Mary Neighbors	Botanist Information Manager
Wyoming Oil and Gas Conservation Commission	--	--
Wyoming Outdoor Council	Caroline Byrd Dan Heilig	Staff Attorney Associate Director
Wyoming State Engineer's Office	Jay Brines	Water Rights Analyst
Wyoming State Geological Survey	James Case Gary Glass Laura Larsen	Geologist State Geologist --
Wyoming State Historic Preservation Office	John Keck	Preservation Officer
Wyoming State Land and Farm Loan Office	D. Steven Degenfelder Jim Magagna	Deputy Director Director
Wyoming State Treasurer's Office	Ken Rolfness	--
Yates Petroleum	Gene George Chuck Moran Janet Richardson	Consultant Landman --

Table 5.2 List of Preparers and Participants, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Name	EIS Responsibility
BLM INTERDISCIPLINARY TEAM	
NATIONAL APPLIED RESOURCE SCIENCES CENTER (DENVER)	
Scott Archer	Climate, Air Quality
RAWLINS FIELD OFFICE	
Larry Apple	Wildlife, T&E/State Sensitive Species
Mary Apple	Public Affairs
Shirley Bye-Jech	Recreation
Krystal Clair	Socioeconomics, Recreation, Visual Resources
Missy Cook	Clerical, Environmental Coordination
Sarah Crocker	Agriculture, Rangeland, Vegetation, Wild Horses
Susan Foley	Soils and Water Resources
Walter George	Team Leader
Ken Henke	Hazardous Materials, Surface Reclamation
Lynn McCarthy	GIS and Mapping
Sandra Meyers	Cultural and Historic Resources
Clare Miller	Team Leader
Mark Newman	Geology, Mineral Resources, Paleontological Resources
Chris Otto	Agriculture, Rangeland/Vegetation and Wild Horses
Ken Peacock	Hydrology
Kip Purinton	Petroleum Engineering, Production Operations
Mary Read	Wildlife, T&E/State Sensitive Species
Marilyn Roth	Land Status and Prior Rights
John Spehar	Planning Coordinator
RESERVOIR MANAGEMENT GROUP (CASPER)	
Fred Crockett	Reservoir Information, Drilling/Production Operations, and Economics

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Table 5.2 (Continued)

Name	EIS Responsibility
ROCK SPRINGS FIELD OFFICE	
Barbara Amidon	Vegetation, T&E and Candidate Plant Species
Teresa Deakins	Rock Springs Field Office Team Leader
Jon Dolak	Transportation
Dennis Doncaster	Water Resources, Watershed
James Dunder	Wildlife, T&E Animal Species
Patricia Hamilton	Realty
Sally Haverly	Realty
John Henderson	Riparian Areas/Wetlands, Fisheries
Don Judice	Fluid Minerals
John MacDonald	Soils, Hazardous Materials, Reclamation
Bill McMahan	Resource Advisor
Jim Perkins	Range Management
George Schoenfeld	Hazardous Materials
Don Schramm	Transportation
Thor Stephenson	Wild Horses, Range Management
Wayne Sutherland	Geology
Russ Tanner	Cultural Resources
Andy Tenney	Recreation, Visual Resources, Wilderness
David Valenzuela	Geology
Allen White	Hazardous Materials
WYOMING STATE OFFICE	
Laurie Bryant	Paleontological Resources
Susan Caplan	Air Quality
Vickie Daniels	Fluid Minerals
Tom Enright	NEPA Specialist
Ron Hilton	Minerals
Jon Johnson	NEPA Process, Environmental Review
Michael Madrid	Minerals/Leasing
Gretchen Meyer	Remote Sensing

Table 5.2 (Continued)

Name	EIS Responsibility
WYOMING STATE OFFICE (cont.)	
Larry Neasloney	GIS and Mapping
Joe Patti	Field Planning Coordinator
Dennis Stenger	Geological Resources, Minerals
SUBCONTRACTORS	
Brent H. Breithaupt	Paleontological Resources
Uintah Engineering and Land Surveying	
Harold Marshall	Transportation
Nelson Marshall	Transportation
David Weston	Transportation
Earth Tech, Inc.	
Robert O'Neal	Air Quality (Cumulative, Far-Field)
Francoise Robe	Air Quality (Cumulative, Far-Field)
Joseph Scire	Air Quality (Cumulative, Far-Field)
TRC ENVIRONMENTAL CORPORATION	
Michelle Ayers	Air Quality (Emissions, Near-Field)
Cliff Cole	Air Quality (Emissions, Near-Field)
Susan Eatinger	Air Quality (Emissions, Near-Field)
James Zappert	Air Quality (Emissions, Near-Field)
TRC HYDRO-GEO CONSULTANTS	
Vladimir Straskraba	Water Resources
Jeff Wright	Water Resources
TRC MARIAH ASSOCIATES INC.	
S.L. Tiger Adolf	Legal Research, Document Production
Scott Benson	Technical Coordination, Project Description
Karyn Coppinger	Physical Resources
Genial DeCastro	Quality Assurance, Document Production
Peter Guernsey	Project Management, Project Description, Vegetation, Land Use, Socioeconomics, Impact Assessment
Jan Hart	Impact Assessment, Transportation/Road Development Planning, Wildlife Monitoring/Planning

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Table 5.2 (Continued)

Name	EIS Responsibility
TRC MARIAH ASSOCIATES INC. (cont.)	
Gary Heller	Wildlife, T&E and Special Status Species, Land Use, Socioeconomics, Impact Assessment
Jonathan Hughes	Vegetation
Heinz Jacobs	Drafting
Craig Kling	Quality Assurance
David Lanning	Technician
Tamara Linse	Document Production/Coordination/ Technical Editing
James Lowe	Historic Resources
Suzanne Luhr	Drafting
Lance McNees	Cultural Resources
F. Russell Pickering	Wildlife, Noise, Odor, Hazardous Materials, Transportation Planning
Kim Rightmire	Water Resources
Roger Schoumacher	Quality Assurance, Wildlife, Fisheries, Vegetation, Socioeconomics
Craig Smith	Cultural Resources
Keren Stover	Land Use
Diane Thomas	Wildlife, Wetlands, Technical Editing
Joni Ward	Wildlife, Raptor Specialist

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APPENDIX A:
RECLAMATION PLAN

RECLAMATION PLAN
FOR THE CONTINENTAL DIVIDE/WAMSUTTER II
NATURAL GAS PROJECT

Prepared for

U.S. Bureau of Land Management
Rawlins Field Office
Rawlins, Wyoming

and

Rock Springs Field Office
Rock Springs, Wyoming

By

TRC Mariah Associates Inc.
Laramie, Wyoming
MAI Project 1295

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ABBREVIATIONS AND ACRONYMS

APD	Application for Permit to Drill
BLM	Bureau of Land Management
CD/WIIPA	Continental Divide/Wamsutter II Project Area
COE	U.S. Army Corps of Engineers
EIS	Environmental impact statement
ERRP	Erosion Control, Restoration, and Revegetation Plan
IDT	Interdisciplinary Team
LOP	Life-of-project
PLS/ac	Pounds of pure live seed per acre
ROW	Right-of-way
VRM	Visual Resource Management
WDEQ	Wyoming Department of Environmental Quality
WOGCC	Wyoming Oil and Gas Conservation Commission

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A-1.0 RECLAMATION OBJECTIVES

This reclamation plan would be used by the Operators of the Continental Divide/ Wamsutter II Natural Gas Project as guidance to achieve successful reclamation on federal lands within the Continental Divide/Wamsutter II Project Area (CD/WIIPA). Alternate reclamation procedures may be implemented on private and state lands. The plan complies with Bureau of Land Management (BLM) reclamation policy (BLM 1990a) and management directives specified in the Great Divide and Green River Resource Area Management Plans (BLM 1987, 1988, 1990b, 1992, 1996). The reclamation plan was developed based on these policies and directives, Executive Order 11987, and impacts and scoping issues identified in this environmental impact statement (EIS). The procedures presented in this plan are designed to allow flexibility based on specific conditions encountered at each proposed disturbance site. Site-specific reclamation procedures would be developed in each Application for Permit to Drill (APD), right-of-way (ROW) application, or Sundry Notice and submitted to the BLM for review and approval prior to the authorization of surface-disturbing activities.

Short-term reclamation goals would be the immediate stabilization of disturbed areas and the protection of adjacent undisturbed areas from unnecessary degradation. The long-term reclamation objective would be to restore all disturbed lands to conditions equal to or better than predisturbance conditions by developing/re-establishing self-sustaining native vegetation communities that meet or exceed predisturbance parameters for cover, species composition, production, and diversity (i.e., ecosystem reconstruction). Other goals include the protection of surface and ground water resources through the restoration of a geologically and hydrologically stable landform that would support future land uses (i.e., wildlife habitat, recreation, livestock grazing, and mineral exploration) and the prevention of the spread of noxious weeds.

BLM-required reclamation objectives are:

- the isolation and/or removal of all undesirable materials (e.g., poor quality subsoils, contaminated soils, potentially hazardous materials) to protect the rehabilitated landscape from contamination;
- the assurance of subsurface (downhole) integrity to minimize subsidence and/or eliminate ground water co-mingling and contamination (downhole reclamation and abandonment procedures are specified in Section 2.6.12 of the EIS and would be approved by the BLM through a Sundry Notice prior to implementation);
- the recontouring and implementation of other soil conservation, surface manipulation, and water management techniques to establish stable slopes, water courses, and drainage features to minimize erosion and sedimentation;
- the revegetation of reclaimed areas to stabilize soils and establish a self-perpetuating native plant community capable of supporting post-disturbance land uses;
- the establishment of acceptable long-term visual aesthetics by mitigating visual contrasts; and
- the monitoring and management of reclamation sites by Operators to evaluate and encourage continued reclamation success (BLM 1990a).

Site-specific reclamation objectives would be stipulated in Surface Use Plans and/or Erosion Control, Restoration, and Revegetation Plans (ERRPs) (see Section A-6.0).

The reclamation process has been divided into four major phases: predisturbance planning and site preparation, temporary reclamation, permanent reclamation, and reclamation success monitoring. By minimizing the amount of land disturbed through predisturbance planning and initially preparing the site for construction activities with the understanding that the area would eventually be reclaimed (e.g., top soil stripping and stockpiling for later use during site rehabilitation, keeping facilities away from cut-and-fill slopes and in as small an area as possible), the acreage requiring disturbance would be reduced and reclamation success would be facilitated. Temporary reclamation would involve the restoration of areas that may be utilized for the planned development but would not necessarily need to be disturbed for the entire life-of-project (LOP) and would include the stabilization of disturbed areas to control runoff and erosion until permanent reclamation procedures are applied. Construction-related disturbance areas along road ROWs are examples of temporary reclamation sites.

Permanent reclamation would include the rehabilitation of locations no longer needed for the project. A nonproducing well location and associated access road are examples of permanent reclamation sites. Upon project completion, all disturbed areas except roads slated to be retained for other land uses would be permanently reclaimed as designated by the BLM or other landowner. Reclamation success monitoring would involve assessing the status of reclaimed areas to ensure that these areas meet desired site stability and productivity standards. Figure A-1.1 illustrates the proposed reclamation process for the CD/WIIPA.

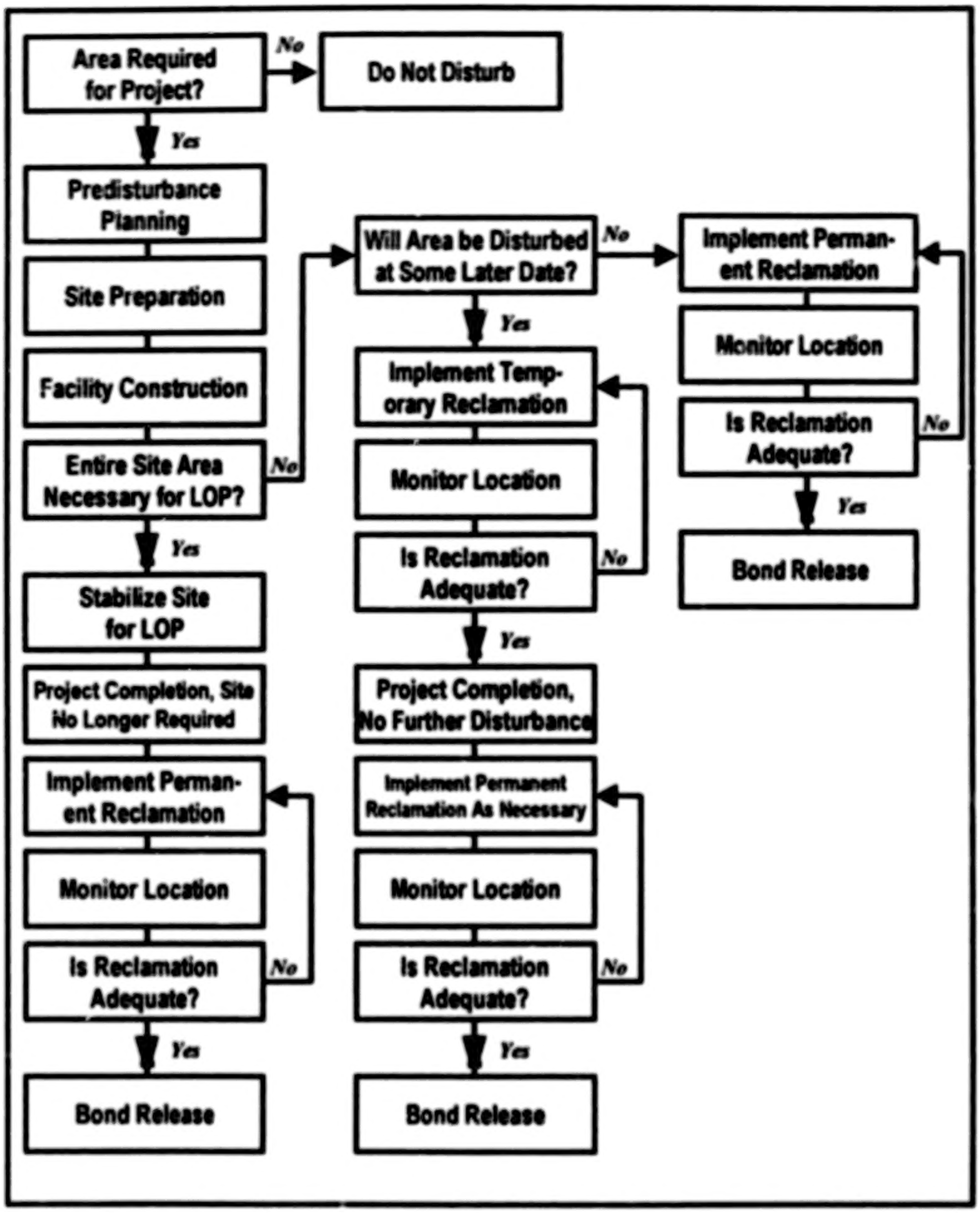

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Figure A-1.1 Reclamation Process, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

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A-2.0 AFFECTED COMMUNITIES

As described in Section 3.2.1 of this EIS, the CD/WIIPA contains eight dominant vegetation types including Wyoming big sagebrush (731,900 acres, 69.0%); greasewood fans and flats (151,100 acres, 14.2%), desert shrub (97,100 acres, 9.2%), saltbush fans and flats (40,600 acres, 3.8%), basin exposed rock/soil (31,000 acres, 2.9%), shrub-dominated riparian (4,500 acres, 0.4%), unvegetated playa (3,400 acres, 0.3%), and mixed grass prairie (1,600 acres, 0.2%) (see EIS Map 3.7).

Approximately 9,200 acres (<1%) of the CD/WIIPA is considered wetland. Wetland areas occur as inclusions within the dominant vegetation types and consist primarily of ponds and reservoirs/impoundments located along ephemeral stream channels. The greatest concentration of wetlands occurs in the northeastern portion of the CD/WIIPA in the Chain Lakes area (see EIS Section 3.2.1.1 and Map 3.6). Stabilized sand dunes and other sandy soil areas also occur throughout the CD/WIIPA and occupy approximately 90,000 acres (8.5%) of the area (see EIS Section 3.1.4.2 and Map 3.4). No active dunes are known to occur.

Reclamation potential within the sagebrush, greasewood, shrub-dominated riparian, and mixed grass communities would be good to excellent; however, in the more barren areas, including the desert shrub, exposed rock/soil, saltbush, and playa communities, reclamation would be limited by shallow soils, droughtiness, salinity, and other adverse conditions. In addition, the sandy soils associated with stabilized dunes are very susceptible to wind erosion when vegetation cover is removed, and the restoration of these areas following disturbance may pose the greatest reclamation challenge on the CD/WIIPA. Reclamation potential may also be limited by other extant conditions on the CD/WIIPA, including: salinity, alkalinity, steep slopes, noncohesive soils, weather conditions (high winds, drought), periodic flooding, short growing seasons, and livestock and wildlife use.

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A-3.0 PREDISTURBANCE PLANNING AND SITE PREPARATION

During selection of drill site, road, pipeline, and ancillary facility locations, consideration of future reclamation needs would facilitate land rehabilitation by minimizing the amount of land disturbed and avoiding, where possible, areas where reclamation potential is low. Avoidance areas stipulated in the EIS include:

- areas with high erosion potential (e.g., rugged topography, steep slopes [>25%], stabilized sand dunes, floodplains),
- areas with saturated soils,
- wetland/riparian areas (e.g., perennial stream channels and open water areas) and a 500-ft buffer,
- ephemeral and intermittent channels and a 100-ft buffer, and
- Visual Resource Management (VRM) Class II areas and areas visible from and within 0.25 mi of contributing segments of the Overland and/or Cherokee Trails.

Approximate disturbance for well locations would be 2.6 acres/location initially and 0.8 acres/location for the life of the well. Approximately 1.8 acres/location would be reclaimed temporarily at each producing well location; permanent reclamation may be implemented in some or all of an area if it is determined that additional disturbance would not be necessary during the LOP. For the purpose of the EIS it is estimated that approximately 4.8 acres/mi of short-term tandem road and pipeline disturbance would be required for the project; long-term disturbance from tandem road and pipeline corridors is estimated at approximately 1.9 acres/mi. In addition, a maximum of approximately 144 acres of disturbance would be required for ancillary facility sites (i.e., water wells [50 wells at 0.5 acres/well], water disposal wells [5 wells at 7.0 acres/well], evaporation ponds [10 ponds at 3.4 acres/pond], compression facilities [5 facilities at 4.0 acres/facility], and a gas processing plant [30 acres]) (see EIS Section 2.6.8). Estimated maximum disturbance levels for the entire project are shown in Table 2.1 of the EIS, and disturbance limitations under the various project alternatives are given in Table 2.2.

Prior to disturbance, Operators and the BLM would conduct on-site inspections of each proposed disturbance site to determine the suitability of proposed facility locations and/or alignments and to develop a site-specific reclamation plan. In addition, Operators would submit for BLM approval Surface Use Plans, Plans of Development, and/or ERRPs for each proposed surface disturbance site. These plans would contain site-specific erosion control, revegetation, restoration, and monitoring procedures and would provide detail on the following:

- project administration, time frames, and responsible parties;
- reclamation objectives;
- predisturbance landscape characteristics, including species composition and plant cover;
- topsoil removal, storage, and handling criteria;
- runoff, erosion, and sedimentation control procedures;
- seedbed preparation, seed mixes and rates, and seed application procedures;
- fertilization, mulching, and/or other site protection (i.e., small-scale fencing and weed, livestock, and herbivore control) requirements; and
- reclamation monitoring and maintenance.

Stormwater pollution prevention plans would be prepared for all project activities requiring greater than 5 acres of disturbance to ensure that precipitation would not cause erosion or sedimentation problems. These plans may be prepared for groups of wells, where multiple well, road, pipeline, and/or ancillary facility locations have been determined. A Notice of Intent would be submitted to the Wyoming Department of Environmental Quality (WDEQ) for review, and a pollution prevention plan prepared and implemented. Copies of the pollution prevention plan and inspection reports would be retained on file in the Operators' offices.

A-3.1 TOPSOIL AND SUBSOIL HANDLING

Topsoil would be salvaged and stockpiled from all proposed disturbance areas unless the BLM deems that leaving topsoil in place (e.g., during pipeline construction) would better facilitate successful reclamation. Prior to BLM authorization of surface disturbance, the amount of topsoil or other suitable plant growth material to be removed and topsoil storage areas would be specified. If less than 6 inches of topsoil are available, topsoils may be mixed with suitable subsoil materials for stockpiling so that a minimum of 6 inches of plant growth material is available for use during reclamation. The need to strip topsoil for some project activities (e.g., along pipeline routes) would be determined on a site-specific basis. Topsoil in excess of 6 inches, if available, may be stored for use in areas off-site that lack sufficient topsoil for reclamation. Whenever possible, topsoil would be used immediately. Topsoil stockpiled for more than 3 months would be protected from erosion by reducing piles to less than 3 ft in height and by seeding and possibly mulching.

Topsoil stockpile areas would be marked in the field and noted on maps. Topsoil stockpile surface area would be maximized to reduce adverse impacts to soil microorganisms. All surface vegetation stripped with topsoils would be incorporated directly into the topsoil to augment organic matter content and seed source availability, unless shrub materials are required to be handled separately. Runoff would be diverted around topsoil stockpiles to minimize erosional loss. Topsoil stockpiles would be located as close as possible to future reclamation sites.

In most instances, disturbance sites would be designed with a balance of cut and fill, thereby minimizing the volume of subsoil stockpiling required. However, in those areas where subsoil materials would be stockpiled, they would be isolated from topsoil stockpiles and located so as not to affect existing drainages. These stockpiles would be kept as small as possible and would be constructed such that they remain stable until they are used during reclamation. In addition, they would be located such that minimal construction activity is required during recontouring.

The collection and analysis of soil samples from disturbed areas may be required as part of reclamation planning to determine appropriate reclamation seed mixtures and the need for soil amendments. However, in most instances, the vegetation present at and surrounding proposed disturbance sites would provide sufficient information for determining reclamation seed mixes. Soil testing and reports would be the responsibility of the Operators. Testing (as deemed necessary by the BLM) may include, but is not necessarily limited to pH; texture; salinity; alkalinity; nitrogen, phosphorus, and potassium levels; organic matter; and toxic elements (e.g., selenium).

Alternate site preparation procedures may be applied in some areas (i.e., dry alkaline sites, badlands, floodplains, wetland/riparian areas) to facilitate reclamation. In dry alkaline areas (which generally occur at relatively flat sites associated with playas or broad drainages), there is often very little topsoil, and excavations may result in drainage problems. In these areas, vegetation and topsoil removal usually results in the need to import materials from off-site to build up required surfaces. Borrow material sources and quantities would be defined prior to construction. Badland areas also have limited suitable topsoil, with topsoil found only at isolated sandy areas. Augmented volumes of suitable soil materials would be removed from sandy areas and stockpiled with vegetation for later use during reclamation of badland sites. In addition, topsoils in floodplain areas may not be removed, depending on the potential for shallow ground water occurrence.

In wetland/riparian areas, vegetation would be cut to ground level, leaving existing root systems intact. Cut vegetation would be removed from these areas for disposal. Grading activities would be limited to areas directly over pipeline trenches and road surface areas where these corridors cross wetlands. At least 12 inches of topsoil would be salvaged and replaced except in areas with standing water or saturated soils. Use of construction equipment in these areas would be limited, and if standing water or saturated soils are present, wide-track or balloon-tire construction equipment may be used or normal construction equipment would be operated on equipment pads or geotextile fabric overlain with gravel fill. Equipment pads would be removed immediately following completion of construction activities. Trench spoil would be placed at least 10 ft away from drainage channel banks, and dirt, rockfill, and brush riprap would not be used to stabilize ROWs.

A-3.2 WELLPAD AND FACILITY SITE CONSTRUCTION

Prior to construction, proposed pad and facility site locations would be surveyed and staked. Additionally, all erosion control design considerations would be reviewed by the BLM to determine their adequacy. Locations would be designed to parallel the contour with reserve pits on the uphill side of pads whenever possible. Reserve pits would be imperviously lined, as necessary, and pits would not be constructed in floodplain areas or at other locations proximal to open water. Wellpads would be designed and constructed to disturb the smallest area necessary to provide for efficient and safe operations.

All cut-and-fill slopes with greater than 3 ft cut and/or fill would be staked at least every 50 ft. Spoil storage areas would also be staked. All cut-and-fill work would be designed to minimize the amount of material required during construction, and if excess material is generated, it would be incorporated into fill slopes or placed in designated areas and stabilized. Backsloping would be necessary only in areas of steep terrain (>10% slopes).

During construction, interceptor ditches would be installed above cuts and around reserve pits, where necessary. Collector ditches and sediment control structures, designed for a 10-year/24-hr storm event, may be required below fill areas. Flows of less than the 10-year/24-hr event would be diverted and/or collected before being discharged from the disturbed area. Qualified specialists would supervise the installation of all erosion control structures, including berms, dikes, and trenches, as deemed necessary by the BLM.

No surface disturbance would be allowed on slopes of greater than 25% unless proposed erosion control and rehabilitation/revegetation procedures are deemed adequate by the BLM. In addition, most construction sites in floodplains would be located on imported fill compacted on the existing ground surface or geotextile membrane. The entire wellpad may be bermed in these areas. Detailed engineering proposals, revegetation and restoration plans, and a site-specific environmental analysis by the BLM would be required.

A-3.3 ROAD AND PIPELINE LOCATION AND ALIGNMENT

To minimize disturbance associated with roads and pipelines, pipeline corridors would be partially contained within road ROW corridors, where practical. In addition, existing roads within the CD/WIIPA would be utilized to the maximum extent possible.

Where roads or pipelines must cross drainages, construction and installation operations would be designed to protect drainages and timed to coincide with periods of low flow (late summer, fall, winter). Crossings would be at right angles to drainage channels, where possible. Removal and disturbance of riparian/wetland vegetation would be minimized, and these areas would be reclaimed according to site-specific measures developed in accordance with approved U.S. Army Corps of Engineers (COE) and WDEQ best management practices. All appropriate permits and public notices required by the COE would be obtained prior to construction (e.g., Section 404 permits).

A-3.3.1 Roads

New roads generally would follow natural contours and would be constructed in accordance with BLM road standards (BLM 1985, 1991). For roads on slopes of less than 10%, available topsoil would be stripped from the construction area and placed in windrows within the construction ROW by sidecasting with a grader. After road construction (first fall season during temporary or permanent reclamation), the topsoil would be replaced on road outslopes, and these areas would be reseeded (see Sections A-4.0 and A-5.0).

Surface runoff control would be incorporated into all road designs in accordance with BLM standards (BLM 1985, 1991) and would be approved by the BLM. Road grades, ditches, culverts, sediment traps, material cuts and fills, and topsoil and spoil storage areas would be designed and located in the field prior to construction. Road culvert locations and spacings would be approved by the BLM prior to construction and would be in accordance with BLM standards.

A-3.3.2 Pipelines

When constructing and reclaiming pipelines, existing crowned-and-ditched roads would be used for access, where practical, to minimize surface disturbance. Pipelines would follow new or existing roads or other pipelines, wherever practical. Pipeline trenches would not be placed in access road borrow ditches unless no other reasonable locations are available. In addition, gathering pipelines may be installed on the surface in areas where slopes are greater than 25% and/or where rock outcrops are crossed. Furthermore, when practical, they would be built perpendicular to the contour to minimize the area required for construction.

Clearing of pipeline ROWs would be accomplished with the least amount of disturbance necessary. Vegetation would be removed from pipeline ROWs so as to leave the root systems intact, and the removed vegetation would be spread over disturbed areas to provide protection, nutrient recycling, and a natural seed source. Pipeline trenches would be excavated with a backhoe to minimize disturbance.

Topsoil would generally not be segregated from subsoil during pipeline trenching due to the small size of most pipeline trenches. However, for larger pipelines (e.g., >10 inches in diameter), the BLM may require topsoil salvage from portions of the pipeline ROW. In these areas, vegetation and topsoil would be placed away from construction traffic. Approximately 6 inches of topsoil, or more, if so directed by the BLM, would be removed, and topsoil materials would not be mixed with subsoils. Construction would occur as soon as possible after clearing and grading to minimize exposure of soils to erosion. However, no construction activities would be allowed when soils are too wet to adequately support construction equipment; this action would reduce the potential for rutting. Subsoil and topsoil materials would be stored in windrows adjacent to pipeline trenches to facilitate backfilling and topsoil replacement.

Clean gravel would be used for the upper 1 ft of fill over backfilled pipeline trenches in perennial and intermittent streams. Silt fences or other sediment filtering devices also would be installed along channel banks where sedimentation is excessive and at the base of all slopes adjacent to wetland/riparian areas. Trench plugs would be employed during pipeline construction at nonflumed drainage crossings to prevent diversion of drainage channel flows into upland portions of pipeline trenches. Application of riprap would be limited to areas where flow conditions prevent vegetative stabilization. Riprap placement and installation would comply with COE permit requirements. Pipeline trenches would be dewatered so no silt-laden water flows into drainage channels. Where vegetation is disturbed, temporary sediment barriers such as silt fences and/or staked weed-free straw bales would be installed along the topographic contour at the base of slopes adjacent to the ROW crossing. Temporary sediment barriers would remain in place until permanent revegetation measures have been judged successful by the BLM.

A-4.0 TEMPORARY RECLAMATION

Temporary reclamation would occur on all areas where permanent reclamation is not promptly applied and on areas that may be disturbed during final reclamation. Disturbed areas subject to temporary reclamation include road cut-and-fill areas, portions of each wellpad and ancillary facility site not needed for production-related activities, and topsoil and subsoil stockpiles. Temporary reclamation measures would be applied only as needed, since permanent reclamation measures would be applied concurrently with the completion of most specific project activities.

Temporary reclamation objectives include:

- stabilization of disturbed areas by providing wind and water erosion control to reduce soil loss and the chance of slope failure,
- minimization of surface runoff to prevent the degradation of downstream receiving waters through the use of pollution control techniques (e.g., facility sites would be required to approach zero runoff from the location, using interception ditches, berms, or other structures to capture accidental spills),
- establishment of plant communities to protect soil resources, and
- minimization of visual impacts.

Upon completion of a specific development activity (e.g., road construction, well testing), the area to be temporarily reclaimed would be delineated. For example, all road topsoil storage in outslope areas, as well as the potentially disturbed outer portions of road ROWs, would be stabilized and reseeded until permanent road reclamation is initiated.

Disturbed areas would be graded and contoured to slopes of 3:1 (horizontal:vertical) or less as required to stabilize the area and to provide a suitable seedbed. Contoured areas would be ripped, as necessary, to reduce soil compaction. Ripping in many areas may be conducted after topsoil replacement. Temporary erosion control measures (e.g., waterbars, mulch application, biodegradable netting installation) also would be applied as necessary. To minimize sedimentation of drainage channels and wetlands during the interim period between construction activity and final reclamation, temporary erosion and sediment control measures would be applied. Silt fences or other sediment filtering devices such as weed-free straw bales would be installed at drainage channel banks where sedimentation is excessive and at the base of all slopes adjacent to wetland/riparian areas. Sediment filtering devices would be cleaned out and maintained in functional condition throughout the LOP. To avoid the possibility of mulching materials entering waterways, loose mulch (i.e., mulch not crimped into the soil surface, tackified, or incorporated into erosion control blankets) would not be applied to drainage channel banks.

Seedbed preparation activities would include topsoil replacement and harrowing, discing, or ripping. After topsoil replacement and preparation, the area would be seeded at the first appropriate opportunity, but within 2 years, using a temporary seed mixture developed to facilitate the rapid establishment of vegetation (Table A-4.1). Areas that have been seeded would be visually monitored for seedling establishment and the presence of erosional features and would be restabilized and reseeded, as necessary, until adequate vegetation establishment and site stability is achieved (see Figure A-1.1 and Section A-6.0). In general, the permanent reclamation and success monitoring procedures specified in Sections A-5.0 and A-6.0 also would be applied at temporary reclamation sites.

Table A-4.1 Temporary Reclamation Seed Mixture and Seeding Rates.[1]

Species	Seeding Rate (PLS/acre)[2]
Western wheatgrass (*Elymus smithii*)	2.0
Slender wheatgrass (*Elymus trachycaulum*)	2.0
Streambank wheatgrass (*Elymus riparium*)	2.0
Wild blue flax (*Linum lewisii*)	1.0
Winter wheat (*Triticum aestivum*)[3]	10.0
Total	17.0

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[1] Alternative species may be reseeded in areas where permanent reclamation may be warranted and/or where the establishment of proposed species is repeatedly deemed unsuccessful.

[2] PLS/acre = pounds of pure live seed per acre; alternate seeding rates may be applied in some areas as deemed appropriate by the BLM and specified in approved Surface Use Plans, Plans of Development, and/or ERRPs.

[3] A sterile hybrid would be seeded as cover crop; cover crops would be used only in areas where rapid site stabilization is desired and where further reseeding efforts likely would be conducted.

A-5.0 PERMANENT RECLAMATION

Disturbed areas would be permanently reclaimed as soon as practical, but within 2 years of the determination that these areas are no longer required for the project. Permanent reclamation objectives include all those listed for temporary reclamation (see Section A-4.0), plus the following:

- the re-establishment of self-sustaining native vegetation communities that meet or exceed predisturbance parameters for cover, production, and diversity, as measured at adjacent undisturbed areas;
- the development of hydrologically stable landforms that meet future land uses including livestock grazing, wildlife habitat, recreation, and mineral exploration; and
- the restoration of the visual quality of the area such that it approximates the visual quality of adjacent undisturbed areas in line, form, color, and texture.

A-5.1 FACILITY AND STRUCTURE REMOVAL

All gas and water wells would be abandoned according to relevant BLM and/or Wyoming Oil and Gas Conservation Commission (WOGCC) recommendations. All aboveground wellpad, pipeline, gas processing, and water disposal facilities, including buildings, structures, tanks, reserve pits, flare pits, evaporation pits, and associated hardware, would be dismantled and removed from the site after they are no longer needed. These materials would be salvaged and re-used or disposed of at approved sites.

Any liquid or solid wastes remaining at well locations would be tested and properly disposed of according to state and federal regulations. Reserve or evaporation pit liners would be disposed of according to BLM recommendations by removal to state-approved sites (e.g., Wamsutter landfill) or by appropriate on-site burial. Any concrete foundations, pads, or footings would be adequately broken up and covered or removed. All aggregate used for wellpad, road, and/or ancillary facility site construction also would be removed or suitably buried.

Road reclamation would be conducted as deemed appropriate by the BLM; some roads may remain after project completion. Road reclamation would include the removal of bridges, culverts, cattleguards, sediment control structures, and signs. Drainage-crossing sideslopes would be reduced to no more than 4:1 to reduce bank erosion and produce stable sideslopes. In addition, road barriers or signage to discourage travel on the reclaimed road surface may be required by the BLM.

A-5.2 SURFACE PREPARATION

Surface preparation includes backfilling, grading, and ripping of compacted soils. Additionally, where wetlands have been disturbed and where soil structure contributes to wetland form and function, soils would be compacted to appropriate depths and densities to retain wetland function. In some temporarily reclaimed areas, topsoil removal and short-term storage may also be required.

A-5.2.1 Backfilling and Grading

All disturbed areas would be backfilled and graded (recontoured) to restore disturbed areas to the approximate original contour after facilities and equipment have been removed. Cut-and-fill slopes would be reduced to 3:1 or less. Grading would provide a surface suitable for the replacement of a uniform depth of topsoil, while promoting cohesion between subsoil and topsoil layers, reducing wind erosion, and facilitating moisture capture.

Specialized grading techniques would be applied as necessary and may include slope rounding, bench grading, stair-step grading, and/or contour furrowing. Generally these processes are accomplished either with scrapers or motor graders. Equipment selection would be determined on a site-specific basis dependent on the material to be graded, the size of the area, on-site operating conditions, and equipment availability.

Areas generally requiring backfilling and/or grading include reserve pits, evaporation pits, pipeline trenches, cut-and-fill areas, and any additional areas where unsuitable voids exist or excess fill material has been stockpiled. No visible soil berm (i.e., in excess of 3 inches) would be provided above pipeline trenches. Operator-provided reclamation specialists would ensure that backfilling and grading operations are conducted so as to provide a landscape suitable for successful reclamation.

A-5.2.2 Ripping

Compacted areas such as roads and wellpads would be ripped to a depth of approximately 2 ft to improve soil aeration, water infiltration, and root penetration. Ripping would be accomplished with a motor grader or a tractor using an appropriate attachment. Ripper shanks would be set approximately 1 to 2 ft apart. Waterbars and erosion control devices would be installed on reclaimed areas prior to topsoil replacement, as necessary, to control topsoil erosion (see Section A-5.5).

A-5.3 SEEDBED PREPARATION

Seedbed preparation maximizes seeding efficiency and improves reclamation success. It includes topsoil replacement (with amendments, where appropriate) and discing.

A-5.3.1 Topsoil Replacement

All topsoil salvaged during construction would be uniformly redistributed on the area to be reclaimed to depths of at least 6 inches, or more (up to 12 inches) if readily available, using a scraper or dozer, as appropriate, for the material and site. Topsoil replacement would be scheduled immediately prior to seeding to maximize the potential for seedling establishment. Topsoil may require inoculation with soil microorganisms or fertilization at some locations to facilitate plant establishment and growth. Since precipitation in the CD/WIIPA is low, fertilizers generally would not be applied. Fertilizers would not be utilized proximal to open waters.

A-5.3.2 Discing

After topsoil replacement, newly topsoiled areas would be disced, harrowed, or ripped to reduce soil compaction, break up soil clods, improve root and water penetration, and provide a friable but firm seedbed. The Operator-provided reclamation specialist would determine how discing or harrowing would be accomplished. Generally, discing would be accomplished using a tractor-drawn implement set 2-6 inches deep.

A-5.4 REVEGETATION PRACTICES

A-5.4.1 Seeding

Reclaimed areas would be seeded using specific native species and seeding rates for the various soil and vegetation types present on the CD/WIIPA (Tables A-5.1-A-5.9). All seeds utilized for this project would be certified weed free. The proposed seed mixes were developed based on the following criteria: general conditions within the analysis area; species adaptations to site conditions; usefulness of the species for rapid site stabilization; species success in past revegetation efforts; seed costs and availability; and compliance with Executive Order 11987 and BLM Manual Section 1745 (i.e., use of native species only). Certain introduced species have been successfully used for reclamation in the region; these species may have utility in site stabilization and revegetation where revegetation efforts with native species repeatedly have been unsuccessful. Operators would consult with the BLM and acquire BLM approval prior to the use of introduced species. Seed mixtures applied during revegetation would be designed in coordination with the BLM during the APD and ROW application approval processes.

Final determination of the appropriate seed mixture would be developed on a site-specific basis in coordination with the BLM at the time of field review (APD and ROW application review). Selected seed species may be inoculated with soil microorganisms to facilitate germination and growth. Soil and watershed protection would be emphasized when reclaiming disturbed areas. Areas not exhibiting successful revegetation, as determined during monitoring (see Section A-6.0) would be reseeded and/or improved with soil amendments as deemed necessary by the BLM until adequate vegetative cover is established.

Seeding generally would be done in the fall between September 16 and freeze-up; however, some areas may be seeded in the early spring between spring thaw and April 15. Wherever possible, seed planting would be done along the contour using a rangeland drill equipped with an agitator and depth bands to mix seed and ensure proper seeding

Table A-5.1 Permanent Reclamation Species List for Sagebrush-dominated Communities.[1]

Species	Seeding Rate (PLS/acre)[2]
Grasses	
Thickspike wheatgrass (*Elymus dasystachyum*)	2.0
Western wheatgrass (*Elymus smithii*)	2.0
Bluebunch wheatgrass (*Elymus spicatum*)	2.0
Bottlebrush squirreltail (*Sitanion hystrix*)	2.0
Indian ricegrass (*Oryzopsis hymenoides*)	2.0
Needle-and-thread (*Stipa comata*)	2.0
Forbs	
Scarlet globemallow (*Sphaeralcea coccinea*)	1.0
Wild blue flax (*Linum lewisii*)	0.5
Shrubs	
Wyoming big sagebrush (*Artemisia tridentata wyomingensis*)	0.5
Antelope bitterbrush (*Purshia tridentata*)	1.0
Total	15.0

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[1] This seed mix may be modified based on site-specific conditions, the identification of additional useful species for rapid site stabilization, species success in past revegetation efforts, and seed availability and cost.

[2] PLS/acre = pounds of pure live seed per acre; alternative seeding rates may be applied in some areas as deemed appropriate by the BLM and specified in approved Surface Use Plans.

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Table A-5.2 Permanent Reclamation Species List for Greasewood-dominated Fans and Flats.[1]

Species	Seeding Rate (PLS/acre)[2]
Grasses	
Western wheatgrass (*Elymus smithii*)	3.0
Thickspike wheatgrass (*Elymus dasystachyum*)	2.0
Alkali sacaton (*Sporobolus airoides*)	2.0
Bottlebrush squirreltail (*Sitanion hystrix*)	2.0
Forbs	
Scarlet globemallow (*Sphaeralcea coccinea*)	1.0
Evening primrose (*Oenothera* sp.)	3.0
Shrubs	
Black greasewood (*Sarcobatus vermiculatus*)	1.0
Gardner saltbush (*Atriplex gardneri*)	1.0
Total	15.0

[1] This seed mix may be modified based on site-specific conditions, the identification of additional useful species for rapid site stabilization, species success in past revegetation efforts, and seed availability and cost.

[2] PLS/acre = pounds of pure live seed per acre; alternative seeding rates may be applied in some areas as deemed appropriate by the BLM and specified in approved Surface Use Plans.

Table A-5.3 Permanent Reclamation Species List for Mixed Desert Shrub Communities.[1]

Species	Seeding Rate (PLS/acre)[2]
Grasses	
Western wheatgrass (*Elymus smithii*)	2.0
Bluebunch wheatgrass (*Elymus spicatum*)	2.0
Great basin wildrye (*Elymus cinereus*)	2.0
Indian ricegrass (*Oryzopsis hymenoides*)	2.0
Needle-and-thread (*Stipa comata*)	1.0
Sandberg bluegrass (*Poa sandbergii*)	1.0
Forbs	
Scarlet globemallow (*Sphaeralcea coccinea*)	1.0
Common yarrow (*Achillea millefolium*)	1.0
Wild blue flax (*Linum lewisii*)	1.0
Northern sweetvetch (*Hedysarum boreale*)	1.0
Shrubs	
Wyoming big sagebrush (*Artemisia tridentata wyomingensis*)	0.5
Rubber rabbitbrush (*Chrysothamnus nauseosus*)	1.0
Common winterfat (*Krascheninnikovia lanata*)	1.0
Shadscale (*Atriplex confertifolia*)	2.0
Total	18.5

[1] This seed mix may be modified based on site-specific conditions, the identification of additional useful species for rapid site stabilization, species success in past revegetation efforts, and seed availability and cost.

[2] PLS/acre = pounds of pure live seed per acre; alternative seeding rates may be applied in some areas as deemed appropriate by the BLM and specified in approved Surface Use Plans.

Table A-5.4 Permanent Reclamation Species List for Badlands (Basin Exposed Rock and Soil) Communities.[1]

Species	Seeding Rate (PLS/acre)[2]
Grasses	
Sheep fescue (*Festuca ovina*)	3.0
Bottlebrush squirreltail (*Sitanion hystrix*)	3.0
Alkali sacaton (*Sporobolus airoides*)	3.0
Forbs	
Gooseberryleaf globemallow (*Sphaeralcea grossulariaefolia*)	1.0
Northern sweetvetch (*Hedysarum boreale*)	2.0
Evening primrose (*Oenothera* sp.)	1.0
Shrubs	
Winterfat (*Krascheninnikovia lanata*)	1.0
Gardner saltbush (*Atriplex gardneri*)	1.0
Total	15.0

---

[1] This seed mix may be modified based on site-specific conditions, the identification of additional useful species for rapid site stabilization, species success in past revegetation efforts, and seed availability and cost.

[2] PLS/acre = pounds of pure live seed per acre; alternative seeding rates may be applied in some areas as deemed appropriate by the BLM and specified in approved Surface Use Plans.

Table A-5.5 Permanent Reclamation Species List for Saltbush Fans and Flats Communities.[1]

Species	Seeding Rate (PLS/acre)[2]
Grasses	
Sandberg bluegrass (*Poa sandbergii*)	1.0
Western wheatgrass (*Elymus smithii*)	1.0
Thickspike wheatgrass (*Elymus dasystachyum*)	1.0
Alkaligrass (*Puccinellia distans*)	2.0
Bottlebrush squirreltail (*Sitanion hystrix*)	1.0
Alkali sacaton (*Sporobolus airoides*)	2.0
Forbs	
Gooseberryleaf globemallow (*Sphaeralcea grossulariaefolia*)	1.0
Northern sweetvetch (*Hedysarum boreale*)	2.0
Evening primrose (*Oenothera* sp.)	1.0
Shrubs	
Winterfat (*Krascheninnikovia lanata*)	1.0
Gardner saltbush (*Atriplex gardneri*)	1.0
Shadscale (*Atriplex confertifolia*)	1.0
Black greasewood (*Sarcobatus vermiculatus*)	1.0
Total	16.0

---

[1] This seed mix may be modified based on site-specific conditions, the identification of additional useful species for rapid site stabilization, species success in past revegetation efforts, and seed availability and cost.

[2] PLS/acre = pounds of pure live seed per acre; alternative seeding rates may be applied in some areas as deemed appropriate by the BLM and specified in approved Surface Use Plans.

Table A-5.6 Permanent Reclamation Species List for Wetland/Riparian Communities.[1]

Species	Seeding Rate (PLS/acre)[2]
Grasses/Grass-like	
Streambank wheatgrass (*Elymus riparius*)	1.0
Nebraska sedge (*Carex nebrascensis*)	1.0
Beaked sedge (*Carex rostrata*)	1.0
Redtop (*Agrostis stolonifera*)	1.0
Bluejoint reedgrass (*Calamagrostis canadensis*)	1.0
Tufted hairgrass (*Deschampsia caespitosa*)	2.0
Alkali bulrush (*Scirpus maritimus*)	2.0
Cattail (*Typha latifolia*)	0.5
Forbs	
Northern sweetvetch (*Hedysarum boreale*)	1.0
Blue-leaf aster (*Aster glaucodes*)	1.0
Golden banner (*Thermopsis montanus*)	1.0
Red clover (*Trifolium pratense*)	1.0
Shrubs/Trees[3]	
Golden currant (*Ribes aureum*)	1.0
Red osier dogwood (*Cornus stolonifera*)	1.0
Silver buffaloberry (*Shepherdia argentea*)	1.0
Woods rose (*Rosa woodsii*)	1.0
Narrowleaf cottonwood (*Populus angustifolia*)	NA[4]
Sandbar willow (*Salix exigua*)	NA[4]
Total	17.5

---

[1] This seed mix may be modified based on site-specific conditions, the identification of additional useful species for rapid site stabilization, species success in past revegetation efforts, and seed availability and cost.

[2] PLS/acre = pounds of pure live seed per acre; alternative seeding rates may be applied in some areas as deemed appropriate by the BLM and specified in approved Surface Use Plans.

[3] Planting of shrubs and trees would be dependent on site-specific riparian objectives.

[4] Planted as containerized stock, sprigs, or poles.

Table A-5.7 Permanent Reclamation Species List for Mixed Grass Prairie Communities.[1]

Species	Seeding Rate (PLS/acre)[2]
Grasses	
Western wheatgrass (*Elymus smithii*)	2.0
Thickspike wheatgrass (*Elymus dasystachyum*)	3.0
Slender wheatgrass (*Elymus trachycaulum*)	2.0
Indian ricegrass (*Oryzopsis hymenoides*)	2.0
Bottlebrush squirreltail (*Sitanion hystrix*)	1.0
Needle-and-thread (*Stipa comata*)	1.0
Green needlegrass (*Stipa viridula*)	2.0
Forbs	
Wild blue flax (*Linum lewisii*)	2.0
Scarlet globemallow (*Sphaeralcea coccinea*)	2.0
Total	17.0

---

[1] This seed mix may be modified based on site-specific conditions, the identification of additional useful species for rapid site stabilization, species success in past revegetation efforts, and seed availability and cost.

[2] PLS/acre = pounds of pure live seed per acre; alternative seeding rates may be applied in some areas as deemed appropriate by the BLM and specified in approved Surface Use Plans.

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Table A-5.8 Permanent Reclamation Species List for Playas and Alkaline Areas.[1]

Species	Seeding Rate (PLS/acre)[2]
Grasses	
Muhly (*Muhlenbergia* spp.)	2.0
Alkaligrass (*Puccinellia distans*)	3.0
Alkali sacaton (*Sporobolus airoides*)	2.0
Western wheatgrass (*Elymus smithii*)	2.0
Forbs	
Gooseberryleaf globemallow (*Sphaeralcea grossulariaefolia*)	1.0
Strawberry clover (*Trifolium fragiferum*)	2.0
Northern sweetvetch (*Hedysarum boreale*)	2.0
Shrubs	
Gardner saltbush (*Atriplex gardneri*)	1.0
Black greasewood (*Sarcobatus vermiculatus*)	1.0
Total	16.0

[1] This seed mix may be modified based on site-specific conditions, the identification of additional useful species for rapid site stabilization, species success in past revegetation efforts, and seed availability and cost.

[2] PLS/acre = pounds of pure live seed per acre; alternative seeding rates may be applied in some areas as deemed appropriate by the BLM and specified in approved Surface Use Plans.

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Table A-5.9 Permanent Reclamation Species List for Stabilized Sand Dune Communities.[1]

Species	Seeding Rate (PLS/acre)[2]
Grasses	
Prairie sandreed (*Calamovilfa longifolia*)	3.0
Bluebunch wheatgrass (*Elymus spicatum*)	1.0
Sand dropseed (*Sporobolus cryptandrus*)	1.0
Indian ricegrass (*Oryzopsis hymenoides*)	2.0
Needle-and-thread (*Stipa comata*)	1.0
Basin wildrye (*Elymus cinerus*)	1.0
Forbs	
Gooseberryleaf globemallow (*Sphaeralcea grossulariaefolia*)	1.0
Desert Indian paintbrush (*Castilleja chromosa*)	1.0
Northern sweetvetch (*Hedysarum boreale*)	1.0
Wild blue flax (*Linum lewisii*)	1.0
Shrubs	
Wyoming big sagebrush (*Artemisia tridentata wyomingensis*)	1.0
Rubber rabbitbrush (*Chrysothamnus nauseosus*)	1.0
Spiny hopsage (*Grayia spinosa*)	1.0
Douglas rabbitbrush (*Chrysothamnus vicidiflorus*)	1.0
Total	17.0

---

[1] This seed mix may be modified based on site-specific conditions, the identification of additional useful species for rapid site stabilization, species success in past revegetation efforts, and seed availability and cost.

[2] PLS/acre = pounds of pure live seed per acre; alternative seeding rates may be applied in some areas as deemed appropriate by the BLM and specified in approved Surface Use Plans.

depths. Seeds would be planted 0.25 to 1.50 inches deep; most seeds would be planted 0.25 inches deep. When drill seeding is not practical due to steep slopes or wet soil conditions, broadcast seeding would be employed, seeding rates would be doubled, and the area would be raked or chained to cover seeds. To facilitate seed establishment, broadcast seeding may be used for shrub and forb species, utilizing either hand or specialized broadcast seeders; fluffy seeds (e.g., winterfat) may be broadcast simultaneously with drill seeds. In addition, at sites where rapid shrub and/or tree establishment is desirable, bare-rooted or containerized stock may be hand-planted. Depending on site-specific circumstances, broadcast seeding may be accomplished following mulch and crimping operations.

A-5.4.2 Mulching

Immediately following seeding, selected areas with a high erosion potential, including steeply sloped areas along roads and/or pipelines, would be uniformly mulched (75% minimum cover) with native grass, hays, small grain straw, wood fiber, and/or live mulch, at a rate of approximately 1.0-2.0 tons/acre. Cotton, jute, or synthetic netting also may be applied at some sites. Only certified weed-free mulches would be used, thereby minimizing the potential for noxious weed introduction. Mulch would be crimped in place, as necessary, using a serrated disc crimper or similar implement. Mulch protects the soil from wind and water erosion, raindrop impact, and surface runoff and holds seeds in place. On slopes of greater than 30% or exceeding the operating limits of the equipment, sites containing 35% surface rock content, sandy soil areas, or other unstable areas, hydromulch, biodegradable erosion control netting, rock mulch, or matting attached firmly to the soil surface would be applied, as necessary.

A-5.5 SEDIMENTATION AND EROSION CONTROL DEVICES

Erosion and sediment control measures and structures would be installed, as appropriate, on all reclaimed areas. The type of control measure used would depend on slope gradient and the susceptibility of disturbed soils to wind and water erosion. Runoff control along linear disturbances such as roads and pipelines would be accomplished using standard measures, including but not limited to waterbars, silt fences, energy dissipators, mulches, and cross ditches. Waterbars would be installed in accordance with BLM specifications and would discharge water into undisturbed vegetation. Waterbars generally would be 12-18 inches deep. When used, silt fences would be placed at the base of all steep fill slopes and would be installed using manufacturer's directions and BLM regulations to prevent overland flow from washing beneath or around the structures. Instream protection devices (e.g., drop structures) also may be required to prevent erosion in drainages crossed by pipelines. Information on the techniques to be implemented, as determined based on site-specific conditions and associated BLM interdisciplinary team requirements, would be included in APDs, ROW applications, and/or Sundry Notice Surface Use Plans, Plans of Development, and/or ERRPs.

Additional runoff and erosion control along ROWs would be accomplished by implementing standard cross drain, culvert, road ditch, and turnout design, as well as timely stabilization and revegetation of exposed areas. Culvert entrances and exits would be riprapped or protected with energy dissipators or other scour-reducing techniques, as needed and where appropriate. Water discharged from culverts, cross drains, road ditches, and turnouts would be directed appropriately either into undisturbed vegetation or natural drainages. Erosion and sedimentation control measures and structures, as approved by the BLM, would be installed across all cut-and-fill slopes within 100 ft of drainage channels. All runoff and erosion control structures would be inspected by Operators annually and after major runoff events and would be maintained (e.g., cleaned out) throughout the LOP.

A-6.0 RECLAMATION SUCCESS MONITORING

Reclamation success would be based on the objectives specified in this plan, and monitoring would occur annually or at shorter intervals until reclamation efforts are deemed successful by the BLM. Monitoring activities would evaluate the condition of reclamation efforts, determine the prognosis for reclamation success, and determine the need for remediation. The actual monitoring procedures for quantitative and qualitative evaluations of reclamation success would be implemented as specified in Surface Use Plans or Plans of Development and approved by the BLM. Standard revegetation success criteria involve the attainment of 50% of predisturbance vegetation leaf or ground cover in 3 years and 80% of predisturbance vegetation leaf or ground cover in 5 years; however, alternative revegetation success criteria (e.g., time frames, percent cover values) may be developed on a site-specific basis as established by BLM on-site interdisciplinary teams (IDTs) (BLM 1997).

The monitoring program presented herein is designed to provide an approach to reclamation monitoring on the CD/WIIPA and includes evaluations which would assist in making future land management decisions in the area. More specific objectives include:

- delineation of BLM and Operator monitoring responsibilities,
- identification of reclamation success criteria, and
- specification of monitoring protocols.

Both temporary and permanent reclamation success would be monitored. Temporary reclamation monitoring would include visual observations of soil stability, effectiveness of erosion control practices, and qualitative evaluations of vegetation establishment and assessments of weed invasion. Operators would be responsible for weed control on surface disturbance and reclamation sites. Control measures would adhere to those specified by the BLM. If chemical weed controls are deemed to be necessary by the BLM, chemicals would be used only in the season or growth stage during which they are most effective. In addition, they would be applied only by certified personnel using approved precautions, application methods, and rates in compliance with all applicable federal, state, and local regulations. Use of herbicides would be avoided near open waters or during extremely windy conditions.

Permanent reclamation would be visually monitored for soil stability, particularly near wetland/riparian areas, open waters, or ephemeral stream channels. Mulch effectiveness and other erosion control devices would be assessed, and qualitative evaluations of vegetation establishment and success would be made. Quantitative measurements for vegetation success as measured by percent leaf and ground cover, production, shrub establishment, and/or measures of diversity would be implemented as specified by the BLM. If reclamation monitoring reveals that soil stability, weed abundance, or vegetation establishment/productivity do not meet required standards, additional treatments would be promptly undertaken by Operators in cooperation with the BLM. Continued efforts would be required until satisfactory cover and productivity are achieved and the site is adequately stabilized. Additional treatments could include, but are not limited to, installation of additional erosion control devices, fencing, herbicide or fertilizer application, reseeding, or remulching.

A-6.1 MONITORING RESPONSIBILITY

Reclamation monitoring would be the responsibility of the BLM and the Operators. Monitoring would be accomplished through joint coordinated monitoring efforts. Further detail on BLM/Operator monitoring responsibilities would be provided in site-specific Surface Use Plans and/or ERRPs.

Operators would submit an initial monitoring plan, including monitoring locations, time frames, and methodologies, for each proposed disturbance in Surface Use Plans or ERRPs, and plans would be approved by the BLM prior to disturbance. The initial monitoring plan would constitute the Implementation Phase of monitoring and would follow the guidelines presented in Addendum A-A (FORM I) of this appendix. Monitoring would be conducted by a qualified Operator representative (in coordination with the BLM) following initial rehabilitation work. Monitoring areas would be re-examined at the end of the first growing season. Results would be documented in a report (see Addendum A-B, FORM II) to the BLM. Problem areas identified during monitoring would receive follow-up rehabilitation/erosion control measures.

During the second growing season, the BLM would revisit established monitoring sites. Original methodologies would be repeated and the status of reclamation efforts would be assessed using the guidelines established in FORM II (Addendum A-B). Results would be documented and a report prepared. Monitoring results would be provided to each Operator to show progress and call attention to additional stabilization/reclamation needs. Additional monitoring sites would be established by the BLM (in coordination with the Operator) for long-term monitoring on significant problem areas not covered by initial efforts.

Follow-up monitoring using the established sites and methodologies would be conducted annually or as necessary by the BLM until reclamation goals are attained (see Section A-6.3). Once reclamation goals are attained, the monitoring site may be abandoned; however, reference points would remain to allow for potential future evaluation. It is expected that most monitoring sites would reveal adequate site reclamation within approximately 5 years, and therefore monitoring activities usually would be discontinued after 5 years. This would allow personnel to concentrate on monitoring installation and evaluation on long-term problem sites. Operators would be advised of reclamation status through joint review of monitoring sites. Annual reports would continue, as would direction for additional remedial reclamation efforts, if necessary.

Generally, reclamation success would be based on site-specific potential. Revegetation objectives and success criteria (FORM I) would be tailored to site potential and agreed on by both Operators and the BLM. When the site has reached long-term stabilization and the composition of desired forage is consistent with the above objectives and criteria, the monitoring site would be abandoned. Monitoring data would be compiled by the BLM to provide future guidance for successful reclamation planning.

A-6.2 MONITORING PROTOCOL

The forms presented in Addenda A and B serve as guidelines for the collection of site-specific information, identification of revegetation success standards, documentation of treatments, and a record for evaluation.

The monitoring plan contained in Surface Use Plans and/or ERRPs would cover the parameters outlined on the Revegetation and Erosion Monitoring/Background Data form (Addendum A-A, FORM I) and would identify the Operators that would collect these data. Background data would be collected following initial reclamation work. A report containing this information would be prepared prior to annual reviews. Data collection would be accomplished using point sampling transects on adjacent undisturbed areas of the same vegetation type. These transects would be established with permanent stakes on locations described in Surface Use Plans and/or ERRPs.

The Revegetation and Erosion Monitoring Evaluation form (Addendum A-B, FORM II) would be used for annual monitoring conducted by the Operators during the first growing season and by the BLM in subsequent years and until monitoring ceases. Data collection would take place during the seed-ripe stage of plant development, and evaluation reports containing this information would be prepared for annual reviews.

A-6.3 GENERAL SUCCESS CRITERIA

The following general success criteria would be used to determine the attainment of adequate site rehabilitation and whether bond liability should be released; alternative criteria (e.g., time frames, percent cover values) may be developed site-specifically based on BLM IDT on-site determinations. Additional success criteria (e.g., productivity, diversity, shrub establishment) would be included, as necessary, in site-specific Surface Use Plans, Plans of Development, or ERRPs and would be approved by the BLM prior to site disturbance. Interim reclamation criteria (see Section A-6.3.2) generally would be applied for determining the disturbance limit thresholds identified for project development Alternatives A and B (see EIS Sections 2.2 and 2.3).

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A-6.3.1 General Criteria

- There would be no contaminated materials remaining at or near the surface, and all buried undesirable materials would be physically isolated for long-term stabilization.

- The subsurface would be stabilized, holes would be plugged, and subsurface integrity would be ensured. No indications of open or unplugged holes, subsidence, slumping, and/or significant downward movement of surface soil materials would be visible.

- The reclaimed area would be stable and would not exhibit large rills or gullies (e.g., 3 inches wide/deep), perceptible soil movement or head cutting in drainage, and/or slope instability on or adjacent to the reclaimed area.

- The soil surface would be stable and have adequate surface roughness to reduce runoff and capture rainfall and snow melt.

- Vegetative canopy cover, production, and species diversity would approximate the surrounding undisturbed areas. The vegetation would stabilize the site and support postdisturbance land uses, provide for natural plant community succession and development, and be capable of renewing itself. There would be evidence of successful on-site establishment of species included in the planting mixture or other desirable species and/or evidence of vegetation reproduction, either spreading by rhizomatous species or seed production.

- The reclaimed landscape would have characteristics that approximate the visual quality of the adjacent area with regard to location, scale (e.g., line, form, and texture), shape, color, and orientation of major landscape features and would meet the needs of the postdisturbance land uses.

- During and following reclamation activities, Operators would monitor and protect the reclaimed landscape to help ensure reclamation success until the liability and bond are released. Each of the previous six standards would be maintained until it can be determined that the reclamation effort was successful.

- With the exception of active work areas, all disturbed highly erosive or sensitive areas to be left bare or unreclaimed for more than 3 months would have a protective cover of suitable material in the form of mulch, matting, or vegetative growth. All other disturbed areas would have an effective protective cover within 1 year.

A-6.3.2 Interim Reclamation Criteria (Years Two - Five)

- Seeding density. The density and abundance of desirable species would be at least three to four seedlings/ft of drill row (if drilled) or transect (if broadcast) for most areas. In some sparsely vegetated areas such as badlands and sodic and saline/alkaline bottomlands, this standard may be reduced to one to two seedlings/ft to be commensurate with the naturally low vegetative cover, unless significant surface erosion is anticipated.

- Percent cover. Total vegetative (foliar) or ground cover would be 30-50% of predisturbance cover as measured along the reference transect for establishing baseline conditions.

- Species diversity. At least 20% of the species contained in the seed mix and/or present on adjacent areas would be present, and no single species would account for more than 50% of the total vegetative cover unless its dominance is higher than 50% on adjacent undisturbed areas.

- Undesirable species. Weeds or other undesirable species would comprise no more than 10% of the total vegetative cover. All noxious weeds would be controlled.

A-6.3.3 Final Reclamation Criteria (Years Three - Ten)

- Percent cover. Total vegetative (foliar) or ground cover would be 50-80% of predisturbance cover as measured along the reference transect for establishing baseline conditions.

- Dominant species. Ninety percent of the revegetation would consist of species included in the seed mix and/or occurring in the surrounding natural vegetation or as would be deemed desirable by the BLM as measured along the reference transect for establishing baseline conditions.

- Erosion condition/soil surface factor. Erosion condition of reclaimed areas would be equal to or in better condition than that measured for the reference transect for establishing baseline conditions.

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A-7.0 REFERENCES

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_____. 1990a. Wyoming policy on reclamation. U.S. Department of the Interior, Bureau of Land Management, Rawlins District Office, Rawlins, Wyoming. February 2, 1990.

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ADDENDUM A-A:

FORM I
REVEGETATION AND EROSION MONITORING/BACKGROUND DATA

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FORM I

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Revegetation and Erosion Monitoring/Background Data

A. Revegetation Project Name: ____________________

Company: ____________ Telephone No: (   ) ____________

Data Collected By: ____________ (Company/Agency Representative)

Monitoring Site Number: ____________________

B. Legal Location C. Slope % ____ D. Key Species in Reference Vegetation

Twp. ____ Aspect ____ ____________ - ________ %
Rng. ____ Elevation ____ ____________ - ________ %
Sec. ____ (include construction map with transect site marked) ____________ - ________ %
Sub. ____ ____________ - ________ %
____________ - ________ %
____________ - ________ %

E.

Soil:	Texture	- Rock Content		Texture	- Rock Content
0-6"	________	- ________%	12-18"	________	- ________%
6-12"	________	- ________%	18-24"	________	- ________%

F. Disturbance Description: Date ____________________
____
____

G. Revegetation Objective(s): ____________________
____
____

H. Criteria for Determining Success: ____________________
____
____

I. Reclamation Treatment Record - Data/season applied: ____________

1. Topsoiling: ____________________
____

2. Erosion Control (type and method of installation): ____________
____
____

Page 2 of 3

FORM I, Continued

3. Soil Amendments (type, amount, and method of application): ______________________

____

4. Seed Mix (lbs pure live seed/acre by species): ______________________

____

5. Mulch (type and method of application): ______________________

____

6. Mechanical treatments (type and rationale): ______________________

____

7. Remarks: ______________________

____

J. Attach a 35 mm photograph of the monitoring transect and reference plot (if applicable) with dates. Photograph sites should be clearly marked on a reference map.

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Items requiring further explanation:

B. A 1:24,000 topographic map can be used to attain this information. This report would include the monitoring site transect location on the detailed construction drawings contained in the Surface Use Plans or ERRPs.

D. Reference vegetation serves as a standard of comparison to assess potential species for revegetation and success. The nature of comparisons with reference vegetation would depend on revegetation objectives. A reference plot location would be established on the ground and marked on Surface Use Plan and/or ERRP maps. A 35 mm photo of the plot would accompany the form.

G. Soil stability, productivity restoration, and wildlife habitat enhancement are general examples of objectives. More specific objectives may be provided.

H. Examples of Criteria for Success could include 60% ground cover for erosion control, soil surface factors of less than 45 (see Addendum B), specific plant species density and/or diversity requirements for wildlife habitat, and specific production for livestock grazing. Criteria must be defined and measurable.

I. The reclamation treatment record would document what was actually done on the ground, not necessarily what is outlined in Surface Use Plans and/or ERRPs. Short explanations of when topsoiling was completed, the erosion control methods used, fertilizer types and rates, seed mixes and seeding rates, mulching methods, etc., would be described in this section. Any additional erosion control measures should be included under remarks.

J. A photo record of the transect line and any additional erosion control measures would be included. Each transect would have one photo showing the general view along the transect and one photo showing transect detail of vegetation/soil surface. Date, transect, and direction of view would be labeled on each photo. Permanent photomonitoring points also would be established at appropriate vantage locations of drill sites, pipeline and access road ROWs, and ancillary facility sites. Each photomonitoring point would be permanently marked with rebar and identified on a topographic map of the area. The location of each point would be described in detail to assist in relocation. Photos would be taken at each photomonitoring point prior to initiation of construction. Photos, framing the same scene as previously taken, would be taken at each formal site visit until reclamation standards have been met.

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ADDENDUM A-B:

FORM II
REVEGETATION AND EROSION MONITORING EVALUATION

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FORM II

Page 1 of 4

Revegetation and Erosion Monitoring Evaluation

A. Revegetation Project Name: ______________________________

Company: ____________________ Telephone No: (   ) ____________

Data Collected By: ____________________ (Company/Agency Representative)

Monitoring Site Number: ______________________________

B. Revegetation Evaluation:

1. Percent Cover

_____ % Plant
_____ % Litter
_____ % Rock
_____ % Bare Ground
_____ % Water
100 % Total

2. Dominant Species - Relative Percent

______________________________ - ________
______________________________ - ________
______________________________ - ________
______________________________ - ________
______________________________ - ________
______________________________ - ________
______________________________ - ________
______________________________ - ________
______________________________ - ________

3. Seedling Density & Abundance

______________: Average plants per linear ft (drill row/transect)
______________: Rating

4. Grazing Impact (Utilization)

______________: Utilization
______________: Rating

5. Weed Investigation: ______________________________

____

____

6. Erosion Evaluation (see the attached table): ____________________

____

____

7. Other Comments: ______________________________

____

____

____

____

EROSION EVALUATION: Evaluate conditions 50 ft on either side of transect line. Assign a numerical rating for each category. (see page 4 of 4 for explanation)

SURFACE LITTER	No movement, or if present, less than 2% of the litter has been translocated and redeposited against obstacles. **0 or 3**	Between 2 and 10% of the litter has been translocated and redeposited against obstacles. **6**	Between 10 and 25% of the litter has been translocated and redeposited against obstacles. **8**	Between 25 and 50% of the litter has been translocated and redeposited against obstacles. **11**	More than 50% of the litter has been translocated and redeposited against obstacles. **14**
SURFACE ROCK MOVEMENT	No movement, or if present, less than 2% of the surface rock fragments have been translocated and/or redeposited against obstacles and show an even distribution on the landscape. **0 or 2**	Between 2 and 10% of the surface rock fragments have been translocated/redeposited against obstacles and have begun to show localized concentration. **5**	Between 10 and 25% of the surface rock fragments have been translocated, redeposited against obstacles, and show localized concentration. **8**	Between 25 and 50% of the surface rock fragments have been translocated, redeposited against obstacles, and show localized concentration. **11**	More than 50% of the surface rock fragments have been translocated, redeposited against obstacles, and show extreme localized concentration. **14**
PEDESTALLING	Pedestals are mostly less than 0.1 inch (2.5 mm) high and/or less frequent than 2 pedestals per 100 ft^2. **0 or 3**	Pedestals are mostly between 0.1 and 0.3 inch (2.5 to 8.0 mm) high and/or have a frequency of 2 to 5 pedestals per 100 ft^2. **6**	Pedestals are mostly between 0.3 and 0.6 inch (8.0 to 15.0 mm) high and/or have a frequency of 5 to 7 pedestals per 100 ft^2. **9**	Pedestals are mostly between 0.6 and 1.0 inch (15.0 to 25.0 mm) high and/or have a frequency of 1 to 10 pedestals per 100 ft^2. **12**	Pedestals are mostly over 1.0 inch (25.0 mm) high and/or have a frequency of over 10 pedestals per 100 ft^2. **14**
FLOW PATTERNS	If present, less than 2% of the surface areas shows evidence of recent translocation and deposition of soil and litter. **0 or 3**	Between 2 and 10% of the surface area shows evidence of recent translocation and deposition of soil and litter. **6**	Between 10 and 25% percent of the surface area shows evidence of recent translocation and deposition of soil and litter. **9**	Between 25 and 50% of the surface area shows evidence of recent translocation and deposition of soil and litter. **12**	Over 50% of the surface area shows evidence of recent translocation and deposition of soil and litter. **15**
RILLS	Rills, if present, are mostly less than 0.5 inch (13.0 mm) deep, and generally at infrequent intervals over 10 ft. **0 or 3**	Rills are mostly 0.5 to 1.0 inch (13.0 to 25.0 mm) deep and generally at infrequent intervals over 10 ft. **6**	Rills are mostly 1.0 to 1.5 inches (25.0 to 38.0 mm) deep and generally at 10-ft intervals. **9**	Rills are mostly 1.5 to 3.0 inches (38.0 to 76.0 mm) deep and at intervals of 5 to 10 ft. **12**	Rills are mostly 3.0 to 6.0 inches (76.0 to 152.0 mm) deep and at intervals of less than 5 ft. **14**
GULLIES	No gullies, or if present, less than 2% of the channel bed and walls show active erosion (are not vegetated); gullies make up less than 2% of the total area. **0 or 3**	Between 2 and 5% of the channel bed and walls show active erosion (are not vegetated), or gullies make up between 2 and 5% of the total area. **6**	Between 5 and 10% of the channel bed and walls shows active erosion (are not vegetated), or gullies make up between 5 and 10% of the total area. **9**	Between 10 and 50% of the channel bed and walls show active erosion (are not vegetated), or gullies make up between 10 and 50% of the total area. **12**	Over 50% of the channel bed and walls show active erosion (are not vegetated) along their length, or gullies make up over 50% of the total area. **15**
SOIL MOVEMENT	Depth of recent deposits around obstacles or in microterraces, and/or depth of truncated areas is between 0 and 0.1 inch (9.0 to 2.5 mm) **0 or 3**	Depth or recent deposits around obstacles or in microterraces, and/or depth of truncated areas is between 0.1 and 0.2 inch (2.5 to 5.0 mm). **5**	Depth of recent deposits around obstacles or in microterraces, and/or depth of truncated areas is between 0.2 and 0.4 inch (5.0 to 10.0 mm). **8**	Depth of recent deposits around obstacles or in microterraces, and/or depth of truncated areas is between 0.4 and 0.8 inch (10.0 to 20.0 cm). **11**	Depth of recent deposits around obstacles or in microterraces, and/or depth of truncated areas is over 0.8 inch (20.0 cm). **14**

Erosion Condition Class: ____________________ Soil Surface Factor: ______________

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Items requiring further explanation:

B.1 Percent cover is determined by examination of points along a 100-ft transect. Documentation consists of recording the total number of hits for plant, litter, rock, and bare ground. Each point noted corresponds to each 1-ft increment along the 100-ft transect. Data summarized from this transect would be recorded here.

B.2 Dominant plant species along the transect are listed and their relative percent cover determined based on the number of hits for each species.

B.3 Seedling Density and Relative Abundance is the total number of plants occurring within plots at the 20, 40, 60, and 80-ft mark along the transect. At these points, perennial seedlings per linear ft or drill row (or in the case of broadcast seedling, per linear ft of transect) are recorded and averaged. Ratings are based on the following evaluation system:

PLANTS/LINEAR FT	RATING
8+	Excellent
5-7	Good
3-4	Fair
0-2	Poor

B.4 The grazing impact is assessed as an ocular estimate of the percent utilization along the transect (at 10-ft intervals). Utilization is based on the removal of seeded species (current year's growth). The amount of utilization is expressed as the percent of aboveground biomass grazed. The following describes the rating for various utilization ranges:

PERCENT UTILIZATION RANGE	RATING	GENERAL DESCRIPTION
1-40	Light	The revegetation may be topped, skimmed, or grazed in patches, 50 to 80% of the number of current seed stalks remain intact. Most young plants are undamaged. There is little or no use of nonpalatable species.
41-60	Moderate	The revegetation appears entirely covered (grazed) as uniformly as natural features and facilities will allow. Fifteen to 25% of the number of current seed stalks remain intact. No more than 10% of the nonpalatable species are utilized.
61-100	Heavy	The revegetation has the appearance of complete and repeated grazing use. Less than 10% of the current seed stalks are remaining. The remaining stubble of preferred grasses may be grazed to the soil surface.

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C. The Erosion Condition Class/Soil Surface Factor method numerically rates soil movement, surface litter, surface rock, pedestalling, flow patterns, and rill/gully formation and translates these physical factors into an evaluation of the vegetation and erosion stability of an area. Results are an expression of current erosion activity and can be used to reflect revegetation success as a function of site stability.

Identify the numerical factor that most nearly describes the current erosion condition by circling the factors. Evaluate each erosional feature if water erosion is the most prevalent type of erosion. Omit surface rock if not present. If wind erosion is mostly prevalent, do not include rill and gully features in the computation. The following identifies the Erosion Condition Class based on the Soil Surface Factor:

EROSION CONDITION CLASS	SOIL SURFACE FACTOR (Range)
Stable	1-20
Slight	21-40
Moderate	41-60
Critical	61-80
Severe	81-100

APPENDIX B:
TRANSPORTATION PLAN

DRAFT
TRANSPORTATION PLAN
CONTINENTAL DIVIDE/WAMSUTTER II
NATURAL GAS PROJECT

Prepared for

U.S. Bureau of Land Management
Rawlins Field Office
Rawlins, Wyoming

and

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April 1999

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ABBREVIATIONS AND ACRONYMS

APD	Application for Permit to Drill
BLM	Bureau of Land Management
CD/WIIPA	Continental Divide/Wamsutter II Project Area
EIS	Environmental impact statement
GIS	Geographic Information System
GRBAC	Green River Basin Advisory Committee
I-80	Interstate 80
NEPA	*National Environmental Policy Act*
Network	The network of proposed and existing collector and local roads used within the CD/WIIPA
Operators	Amoco Production Company, other oil and gas companies, and their subcontractors working on the CD/WIIPA
RFO	Rawlins Field Office
ROW	Right-of-way
RSFO	Rock Springs Field Office
TP	Transportation Plan
TPA	Transportation planning area
TPC	Transportation Planning Committee
TPTSD	Transportation Planning Technical Support Document
Truck or heavy truck	All trucks used for hauling equipment or freight or trucks mounted with special equipment with axle weights of under 32,000 lbs and gross weights of under 80,000 lbs. This could also include trucks with overweight or overwidth permits

B-1.0 INTRODUCTION

B-1.1 OBJECTIVES

This Transportation Plan (TP) was prepared to supplement a proposal by oil and gas companies (Operators) to drill new wells in the Continental Divide/Wamsutter II Project Area (CD/WIIPA) (Map B-1.1), as described in the Continental Divide/Wamsutter II Natural Gas Project environmental impact statement (EIS). Additionally, a TP required for the Greater Wamsutter II Project (Bureau of Land Management [BLM] 1995) and this TP, as expanded herein based on the revised development proposal, serves as the TP for the Greater Wamsutter II Project. This document provides an assessment of future road development and use in and around the CD/WIIPA and provides a basis for future oil- and gas-related exploration and production transportation planning within the area. Potential impacts to the existing transportation system are described in the EIS.

Additional information on road development requirements for this project is provided in the Transportation Planning Technical Support Document (TPTSD) (BLM 1999), which is available for review at the BLM Rawlins Field Office (RFO) and Rock Springs Field Office (RSFO). Annual road planning, development, maintenance, and other issues and concerns are provided in the TPTSD, as is detailed information (including maps) on existing roads/routes and natural obstacles. The TPTSD and associated maps would be updated annually or as necessary as specified in Chapter B-4.0.

The transportation planning area (TPA) for this project includes the CD/WIIPA plus adjacent areas that include roads which may be used to access the CD/WIIPA (Map B-1.2). The TPA includes Interstate 80 (I-80) and its on and off ramps from Rawlins west to exit 142; U.S. Highway 287 north of Rawlins to County Road 4-63; State Highway 789 south from I-80; and several county, BLM, and undeveloped roads/routes on and adjacent to the area. (More detailed maps of the TPA are available for review at the BLM RFO and RSFO.

The use of existing roads and proposed road corridors for local and collector roads is described, and this document, the TPTSD, and applicable transportation codes and standards would be used in the localized planning efforts for each new well location and associated access. Annual operational updates to the TPTSD would be made, as necessary, to detail specific localized transportation networks. All new or upgraded roads in the TPA would conform to the general provisions of this planning document.

The objectives and content of this TP are listed below.

- Public comment opportunities and the issues/concerns raised are identified.
- Existing roads in the TPA which are preliminarily identified as potential project-required collector and local roads are identified on maps, and resource, two-track, and other unimproved roads are also briefly discussed.
- The annual transportation planning/operational update process for the TPTSD is described, and this description includes scheduling, roles and responsibilities, and opportunities for public input.

B-1.2 SCOPE

The scope of this plan includes a brief description/presentation of the existing road network (see Map B-1.2) and the identification of proposed high traffic volume roads/corridors. Relevant requirements for road construction or reconstruction and the development of agreements for use, rights-of-way (ROWs), and maintenance are identified and outlined in the TPTSD.

This plan also applies to the transportation of gas, condensate, or water via pipelines and electric power transmission (power lines) within the CD/WIIPA. Pipelines and power lines generally would be located adjacent to roads to reduce new surface disturbance. In some instances, paralleling roads and lines may lead to increased environmental impacts, in which case pipelines and power lines may be located along alternative routes, and these

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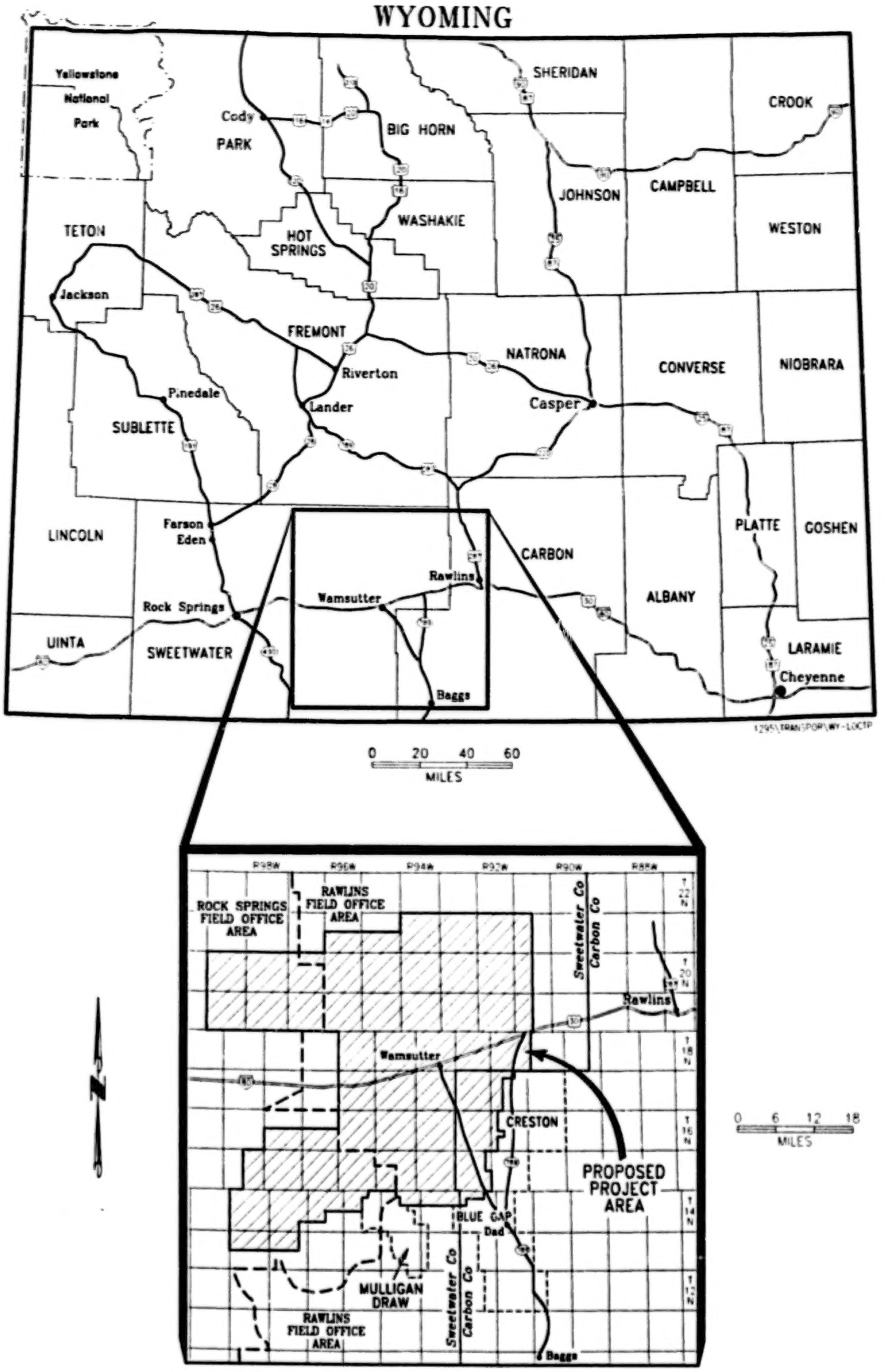

Map B-1.1 General Location Map for the Continental Divide/Wamsutter II Project, Sweetwater and Carbon Counties, 1999.

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alternative routes would be evaluated and sited to minimize environmental impacts. Map 2.2 of the EIS shows the location of major pipeline routes on the CD/WIIPA. Further detail on pipelines is provided in Section 2.6.7 of the EIS.

Some existing roads to and within the CD/WIIPA are under the jurisdiction of the governmental agencies (e.g., BLM, Sweetwater County, Carbon County) who approved their designs and require their maintenance. Roads under private easements between Operators and private landowners may or may not have maintenance requirements or agreements. In addition, there are many non-oil-and-gas roads/routes that are not maintained. Map 2.1 in the EIS illustrates the general location of roads in the CD/WIIPA. Oil and gas field roads may also be under the jurisdiction of government agencies; however, maintenance of these roads is generally conducted by Operators. Maintenance responsibilities are discussed in the TPTSD for this project (BLM 1999). Operators would provide the BLM and Sweetwater and Carbon County officials with copies of road maintenance agreements that include the name of the Operators' designated contact persons. Non-oil-and-gas roads would be maintained as appropriate by the BLM or other ROW holder.

B-1.3 LIMITATIONS

- The condition (e.g., road design, upgrading requirements) and maintenance status (e.g., plowed) of existing roads and casual use routes (e.g., two-tracks) in the TPA are generally identified on maps available for review with the TPTSD at the BLM offices. Many existing roads may not be passable during inclement weather or during winter months. All roads developed and required for this project would need upgrading, maintenance, and winter snow removal. Specific road upgrading and maintenance responsibilities would be identified in annual operational updates to the TPTSD.

- Some existing roads within the TPA may not have public access agreements in place with the BLM and/or private landowner. Except those identified as state or county roads, access may require agreements with private landowners.

- The transportation network described in this document is focused on local and collector roads and potential road corridors; however, existing low traffic volume resource roads and unimproved roads are identified on the detailed maps available for review with the TPTSD at the BLM area offices.

B-2.0 PUBLIC INVOLVEMENT/TRANSPORTATION PLAN SCOPING

Concerns identified during the preparation of past oil and gas development EISs in the region and associated Green River Basin Advisory Committee (GRBAC) meetings led the BLM RFO to request public input on the transportation needs and concerns for access to the CD/WIIPA and surrounding areas. Public scoping was initially conducted in June 1997. Additional input on transportation planning was requested in January 1998, scoping letters were issued, and potentially affected area users and management agencies were invited to attend a meeting on January 29, 1998. Those invited included Operators, county commissioners, state and county transportation departments, the Wyoming Game and Fish Department, recreation/conservation groups, landowners, and others commenting during scoping for the EIS. Additionally, drafts of the TP and the TPTSD were made available for review by the Wyoming Department of Transportation, Sweetwater and Carbon County Road and Bridge and Engineering Departments, Operators, key landowners, environmental groups, and individuals. A complete list of contacts can be obtained from the BLM RFO in Rawlins. Additional input from interested parties will be incorporated in annual operational updates to the TPTSD (see Section B-4.0).

All comments received during the scoping process for the Continental Divide/Wamsutter II project were considered in developing this TP and the TPTSD. Comments included the following.

Road Development

- Roads should not be overdesigned; build roads to minimum standards to deter use and reduce vehicle speeds
- Do not fence roads
- Roads with parallel drainages should be located outside the 100-year floodplain
- Road standards should be consistent across checkerboard lands
- Sources of funding to maintain BLM and county roads should be identified
- Properly located loop roads can eliminate excessive use of some areas
- Analyze alternative travel corridors and road standards
- A transportation planning process that includes the state and counties, and cooperation between all interested parties is needed
- County involvement is necessary in mainline road development and maintenance, and all roads should be built to county road design specifications
- County needs to be involved at APD stage
- Consider a "no net gain" policy for roads
- Establish limits for road development and maintenance
- Address private land access issues from new and existing roads and the problems associated with alternative road designs on private lands
- Implementation of GRBAC transportation planning recommendations, and consideration of Wyoming Outdoor Council comments to GRBAC recommendations
- Road development and transportation management impacts
- Consistency of road development guidelines across BLM district boundaries and across checkerboard lands
- Mineral ownership may affect Operator rights to construct roads on private lands
- Landowners should be contacted prior to any new road construction so that their input and concerns can be addressed up front, and the BLM should not dictate road development activities on private lands
- All roads as shown on Map B-1.2 should be kept for use as collector roads, and upgraded as necessary for proposed uses; additional collector roads will be needed as development progresses
- When maximum road densities are met for the project, road building should cease until an equal amount of old roads are closed
- All stream crossings should be located in areas and constructed in ways that do not decrease channel stability or increase water velocity

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- Road construction and reconstruction actions should be designed and conducted to minimize soil erosion
- Road construction costs and area of disturbance are increased when curves are planned for new roads to reduce visual impacts

Road Use

- Collector roads should be addressed individually in respect to paving or gravel surfacing to prevent mud from being carried on to existing highways
- Operators should enforce speed limits, and vehicle speeds should be reduced
- Use existing two-track roads to access well locations
- The use of looped roads should be minimized to avoid increased traffic
- Identify impacts from fugitive dust

Road Maintenance

- Immediately identify the proposed collector roads that currently need maintenance and action
- County roads should be maintained by the counties since they currently receive funds generated by the Operators; Operators should assist in eliminating problem areas on county roads
- Operators acquiring ROWs over BLM roads will need to enter into cooperative agreements with each other for road upgrades and maintenance
- Road maintenance actions require prioritization
- Appropriate maintenance of cattleguards, wing ditches, and culverts

Road Reclamation

- Closed roads should be obliterated, reclaimed, and signed as such to inform the public
- All roads developed for this project should be reclaimed when they are no longer required
- Reclaim 2 mi of road for every 1 mi constructed
- Roads are prolific in the project area and there is little attempt to decrease their impact to the Muddy Creek watershed and other resources
- Existing roads should be eliminated if another road accesses the same area, and Operators should look for opportunities to close and reclaim unused and redundant roads
- Two-track roads that are not used and which can be reclaimed should be identified
- Roads need to be reclaimed as soon as possible after abandonment
- The ultimate road situation (i.e., after the project is completed) should be similar to predevelopment (pre-1990)

Wildlife

- The proposed collector road along Delaney Rim may be a problem to existing raptor nesting habitat
- Close coordination of the Wyoming Game and Fish Department, BLM, and Operators is needed for development in the Chain Lakes area
- Minimize road densities and total miles of road to minimize impacts to wildlife populations
- New roads increase access into areas which could increase the probability of wildlife poaching and other forms of mortality (road kills)
- New roads cause habitat loss through direct conversion of habitat to road ROWs and increased wildlife disturbance (e.g., decreased use of habitats adjacent to roads, increased stress)
- Use locked gates, signs, and seasonal closures to reduce vehicle traffic thereby protecting wildlife by restricting access
- Field workers should visit wells during mid-day to minimize impacts to wildlife
- Impose speed limits to reduce big game road kills
- Impacts of roads on big game, especially antelope
- All perennial stream crossings should be adequately designed to allow fish passage at all flows

- Impacts to aquatic resources should be minimized to ensure compliance with Section 404 of the *Clean Water Act*
- Plow wildlife/livestock outlets through snow banks along roads in the winter season
- Habitat fragmentation from roads
- Due to extensive road development, requirements are needed to protect wildlife and other resource protection on BLM lands; duplicate roads are being built on private lands
- Avoid special features such as raptor nesting areas, sage grouse leks, crucial big game winter range, and associated buffers
- Impacts of new power lines on sage grouse predation, and avoid power line construction within 0.75 mi of sage grouse leks
- Identify mitigation measures (e.g., vehicular travel restrictions, existing road realignment) to prevent lek and ferruginous hawk nest abandonment
- Noise impacts to sage grouse and ferruginous hawks should be considered
- Pipeline development may improve winter wildlife habitat by removing decadent sagebrush
- Power line construction should be in accordance with raptor-safe criteria established by the Avian Power Line Interaction Committee

Interstate 80, Wyoming State Highways, and Other Developed Road Concerns

- No additional access off I-80 will be allowed
- Height and width restrictions for I-80 underpasses and weight limits on all highways must be observed; fines will be issued for damage and noncompliance
- A cross-over plan should be developed for the safe and proper use of median cross-overs
- Space trucks requiring the use of cross-overs at least 5 minutes apart
- Trucks should not pull onto or be backed-up on the left shoulder of I-80 prior to turning
- Pull trucks onto emergency lanes prior to turning onto cross-over
- Drive to a suitable interchange if cross-overs are not available
- Operators may be liable for repair of cross-over roads
- Cross-over use creates safety and liability problems, and cross-over use may be restricted
- Safety and problem areas along I-80 need to be identified on TP maps
- Approaches off existing highways and county roads will be limited to 2 or 3 per mi per side and will require cattleguards, paving, and adequate sight distance as appropriate for the classified road use
- Additional approaches will be restricted
- Operators are encouraged to use existing approaches
- Turning lanes will be considered for high traffic-volume approaches
- Mud on the highway is a safety concern. Surfacing of roads (up to 1 mi from the highway) may be necessary, but should not be mandated for all cases
- Every highway approach is a conflict point, and permits will be required
- Joint efforts should be made to upgrade (gravel surface) the Red Desert Road
- Cattle guard damage is a problem
- Overweight loads may damage cattleguards and bridges; construction of gated bypasses may be a solution
- Counties require notification prior to moving overweight loads
- Access to permanent facilities needs to be maintained for year-round use and facilities need to be accessible to emergency vehicles
- Most county roads are not all weather roads; therefore, surfacing is needed
- Access approaches will require permits and should be at 90° angles
- The term collector roads needs to be defined and a determination needs to be made if all existing county roads should be considered collector roads and if they need to be all weather roads
- Dust is a problem on existing county roads, and dust abatement measures will be required
- The Sweetwater County Road Department does not have adequate funds for road graveling and upgrading

- Carbon County Road 701 should be considered a collector road and may require gravel surfacing and dust abatement to maintain safety

Pipelines and Power Lines

- Maximize use of existing road and pipeline corridors
- Pipelines and power lines should parallel roads within the same ROW, and impacts should be identified
- Avoid development within existing power line ROWs
- Pipelines and power lines should be buried
- Build cuts along pipeline routes to discourage unauthorized travel along reclaimed ROWs
- Pipeline development may improve winter wildlife habitat by removing decadent sagebrush
- Power line construction should be in accordance with raptor-safe criteria established by the Avian Power Line Interaction Committee
- Pipeline densities could be less if paralleling every road was not the rule
- Pipelines and power lines cannot be constructed within and parallel to I-80 or state highway ROWs; pipeline and power line crossings of I-80 must be bored under the highway
- Identify any improvements to utility lines
- Crossing impacts must be mitigated by Operators
- No unreasonable restrictions on construction of utility and pipeline facilities

Recreation

- Use of roads by the public, public road designations, and public access
- Landowners should allow recreational use on their lands and avoid posting of lands
- Increased access will provide increased recreational opportunity
- Do not fence roads
- BLM signs should be removed to limit unauthorized public use of private roads and lands
- With reclamation, visual impacts are negligible for new roads

Other Concerns

- Operators need to do a better job monitoring damage to cattle guards, closing gates, and restricting unauthorized off-road travel along fencelines, two-track trails, and pipeline ROWs
- Form a task force to develop a coordinated transportation plan to address access issues (county permits, private lands, drainage, safety, Uniform Fire Code compliance, traffic demands, county access), construction plans (e.g., permits, construction use, zone changes), and maintenance specifications (roads, cattleguards, bridges, heavy equipment)
- Difficulties associated with problem-solving by large committees for transportation planning
- The BLM has very few roads in the CD/WIIPA with easements across private and state lands
- The BLM issues ROWs for all its roads
- BLM roads are for use, development, protection, and administration of public lands and resources, and are not necessarily public roads; although public use is generally allowed, roads may be closed or use restricted to fulfill management objectives

B-3.0 EXISTING AND PROPOSED TRANSPORTATION NEEDS

B-3.1 THE EXISTING NETWORK

I-80 is the primary access to the entire CD/WIIPA. Other paved or partially paved roads include State Highway 789, U.S. Highway 287, a section of County Road 4-19, and County Road 4-63. The remainder of the roads are not paved and generally are not surfaced (e.g., gravel, aggregate). Some of these unpaved roads become impassable when wet and during winter, and if these roads are used as access for this project, they would require improvements and increased maintenance including snow removal. County roads (arterial roads) are maintained but in many cases there is no snow removal. County roads provide public access across private land; however, BLM roads or other roads which cross private lands may not have public ROWs. Nearly all of the existing county roads (proposed high-volume roads) within and adjacent to the CD/WIIPA originate at one of the exits of I-80, and most of these roads run north or south from I-80. Most of the routes that are not paved highways or county roads would require ROWs for access and would require improvement or reconstruction before project use. In addition, some realignment of these routes may occur to minimize impacts to sensitive resources, ensure safety, and maximize traffic flow efficiency. Map B-1.2, Maps 2.1 and 2.2 in the EIS, and the detailed maps available for review with the TPTSD show the existing and proposed locations of high-volume roads and/or corridors within the TPA (i.e., arterial roads and other potential collector and local road routes with high initial traffic volumes).

Additional local and resource roads (i.e., local roads = minimum traffic volume roads usually providing the internal access network within an oil and gas field; resource roads = normally spur roads providing point access to oil and gas well locations) are present on the CD/WIIPA, and additional access roads would be constructed as necessary and specified in annual operational updates to the TPTSD (see Chapter B-4.0). Where these new roads duplicate existing two-track roads/routes, the existing two-track may be reclaimed. At field abandonment, many newly constructed local and resource roads are anticipated to be reclaimed unless there is an identified need for the road by other area users. Reclamation activities will be addressed during annual planning and corresponding updates to the TPTSD.

The existing transportation network on the TPA is generally shown on Map B-1.2, and roads/routes are briefly described in the TPTSD (BLM 1999). This system includes state, county, and BLM access roads, most of which originate at I-80 and its exits. Historic use of the roads has been limited primarily to livestock operators, recreationists, and mineral developers. The principle current use of these and other roads in the area is for oil- and gas-related traffic; however, other users include grazing permittees and recreationists. The existing transportation system is generally suitable for all current users.

Undesignated two-track roads/routes also may be used to access the area. These routes are used primarily by grazing permittees and recreationists. Grazing permittees primarily use the two-tracks to access water developments and livestock.

Numerous pipeline routes deliver gas from the CD/WIIPA (see Map 2.2 in the EIS). Most lines parallel I-80; however, numerous gathering system lines are present. Further information regarding the location of pipelines on the CD/WIIPA can be found on the detailed maps available for review with the TPTSD at the BLM offices.

B-3.2 PROPOSED NETWORK USE/ MODIFICATION

The stages of a typical trip necessary for the CD/WIIPA transportation system are listed below.

A. Main movement (i.e., I-80 and state highway lanes for workers with destinations terminating in the CD/WIIPA).
B. Transition (i.e., exits, turnout lanes, where there is a change in travel speed).
C. Distribution/collection (i.e., county, oil/gas field unit, or ranch access roads; collector and local roads).
D. Terminal access (i.e., well location access roads; resource roads).

When planning transportation facilities, all of the described traffic stages can be identified within the system, but any stage could be eliminated if not needed (e.g., intermediate stages may not be necessary). Each movement stage is handled by a separate facility designed specifically for its function. Identifying the stages helps to plan traffic flows.

The TPA transportation network is not anticipated to experience problems at traffic stage changes, due to the relatively low volume of expected traffic (Table B-3.1). The distribution by distance of traffic stage changes within the CD/WIIPA also eliminates the probability of congestion when vehicles turn from collector or local roads to well access roads. The well access roads are dispersed far enough apart and the traffic volumes are low enough that traffic congestion would be unlikely. Although traffic volumes on CD/WIIPA roads generally would be low, heavy vehicles would use the roads throughout the LOP, and without road upgrades, some of these vehicles may become stuck during inclement weather periods, causing traffic flow problems. However, with the implementation of this plan, proper road construction and maintenance would occur, thereby minimizing the potential for this problem.

The estimated traffic requirements for each well are provided in Table B-3.1, and examples of potential traffic volumes on resource, local, and collector roads are provided in Table B-3.2. Construction, drilling, and completion activities have the greatest traffic requirements for the proposed project (an estimated 469 round trips per well over a 56-day period). These activities would most likely be concentrated within localized areas during the first 20 years as the project is developed. The maximum number of round trips per day is estimated to be approximately 1,000, and most trips would originate from I-80.

Localized construction and drilling activity would temporarily place heavy demands on road servicing. Traffic demands would be high in areas where drilling and completion activities are occurring, but would be minimal within other areas of the CD/WIIPA. Once all wells have been completed, traffic requirements would be minimal for the remainder of the LOP (i.e., averaging less than 150 project-required round trips per day for the entire area). Nonetheless, CD/WIIPA roads would be used throughout the LOP until all wells in the area are abandoned and disturbed areas reclaimed. Maintenance of roads remaining on the area after abandonment would be conducted by non-oil-and-gas entities.

B-3.3 ULTIMATE ROAD DISPOSITION

When the field is ready for abandonment (estimated to be approximately 50 years), the transportation network within the TPA would be reclaimed to specifications developed during the annual operational updates. Reclamation protocol are described in Appendix A of the EIS. Improvements to most existing roads likely would be maintained, and some roads identified as necessary or desirable for other area users (e.g., grazing permittees, recreationists) during annual operational updates would be retained.

Resource roads that may be retained after the LOP would be those identified during annual transportation planning as duplicating an existing two-track or other low-volume road/route for which these two-tracks or other roads/routes were reclaimed. In addition, resource roads that are deemed necessary by the BLM for other area uses also may be retained.

County roads likely would be retained in an upgraded status (local/collector road), as would improvements to BLM roads. All other local/collector roads potentially developed as access routes for this project are likely to be entirely reclaimed or returned to conditions similar to those occurring on the area prior to oil and gas development activities.

Road use following project completion likely would be limited to two of the three existing uses (i.e., grazing management and recreation), and responsibility for maintenance of roads would revert back to the counties, private landowners, or BLM. A determination regarding the extent of post-project road maintenance (e.g., winter snow removal) on the TPA cannot be determined at this time since the level of future area use is unknown. Decisions would be made during the later years of the project based on public input received during annual update reviews.

Table B-3.1 Vehicle Characteristics and Estimated Number of Trips Required for the Continental Divide/Wamsutter II Project, Sweetwater and Carbon Counties, 1999.

Truck Type	Average Weight (x 1,000 lbs)	No. of Wheels	Average Speed on the CD/WIIPA[1] (mph)	Average Number of Round Trips per Location	Estimated Total Round Trips[2] (x 1,000)
PROJECT DEVELOPMENT					
Location/Road Construction					
Semi	74	18	20	3	9
Gravel/haul	48	10	20	33	99
Pickup	7	4	30	47	141
Drilling Operations					
Semi	60	18	20	22	66
Fuel and mud	48	10	20	15	45
Logging and water	20	6	20	23	69
Pickup	7-8	4	30	133	399
Completion and Testing					
Semi	74-80	18	20	8	24
Haul A	48	10	20	33	99
Haul B	44	10	20	60	180
Haul C	20	6	20	21	63
Pickup	7-8	4	30	23	69
Pipeline Construction					
Haul B	44	10	20	4	12
Haul C	20	6	20	4	12
Pickup	7-8	4	30	40	120
Development Total	--	--	--	469	1,407
OPERATIONS[3]					
Workover rig[4]	90	18	20	3	9
Haul[5]	48	10	20	425	312
Pickup[5]	7-8	4	30	2,782	417
Operations Total	--	--	--	3,210	738

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[1] Some vehicles may drive at speeds of 45 mph on maintained collector roads.

[2] Assumes 3,000 wells are drilled and completed as producers.

[3] Assumes a well life of 30 years.

[4] The workover rig vehicle would be the largest vehicle (i.e., critical vehicle) required for the project.

[5] Each well loaction would be visited twice a week on average, and approximately 15-20 well locations could be visited daily by a single employee.

Table B-3.2 Example Traffic Volumes for Selected Resource, Local, and Collector Roads, Continental Divide/Wamsutter II Project, Sweetwater and Carbon Counties, 1999.

Road Type (No. of wells)	Estimated Number of Round Trips	Estimated Average Daily Traffic
Resource Road (1 well)	3,688	0.3
Resource Road (10 wells)	30,688	2.8
Local Road (50 wells)	184,400	16.8
Collector Road (100 wells)	306,880	28.0
Collector Road (500 wells)	1,884,000	168.4

B-4.0 ANNUAL PLANNING AND OPERATIONAL UPDATES TO THE TRANSPORTATION PLANNING TECHNICAL SUPPORT DOCUMENT

To accommodate the uncertainty regarding proposed well locations and associated well productivity, future transportation routes within the CD/WIIPA and TPA (see Maps 2.1 and 2.2 in the EIS) would be developed incrementally as wells are developed and associated information on Operator transportation requirements becomes available. Annual operational updates to the TPTSD for the CD/WIIPA would begin in 1999, and annual updates would be available in January each year thereafter until the project is completed or until the transportation system is so well-established that further annual planning is not needed.

To facilitate the planning process, a Transportation Planning Committee (TPC) has been established. The TPC is composed of representative from the BLM, Operators, Sweetwater and Carbon County Transportation Departments, Wyoming Department of Transportation, Wyoming Game and Fish Department, landowners, grazing permittees, recreationists, and other interested groups or individuals. The committee will be responsible for overall transportation planning and for identifying and considering issues and concerns, whereas subcommittees/groups will likely be established for the resolution of site-specific issues (e.g., operational/compliance issues, individual road maintenance, and construction problems).

Annual transportation planning generally would be conducted to determine the location, maintenance, and design criteria for roads developed on the area. This process would involve annual Operator projections for well and ancillary facility developments, public input, and updates on sensitive resources. With this information, the TPC would assist in designing a road network that accommodates Operator and other area user needs, minimizes potential impacts to sensitive environmental resources, and maximizes traffic flow efficiencies commensurate with existing and potential needs.

The existing transportation network in the area is generally suitable for existing uses; however, as areas with natural gas resource potential are identified and developed, changes to the existing network would be required. Therefore, Operators would be required to provide to the TPC annual projections specifying proposed well and facility site locations and associated traffic requirements (e.g., estimated number of round trips; duration of construction, drilling, and completion activities; vehicle sizes). This information would be provided to the TPC by approximately mid-October of each year for the LOP, or until no longer required by the TPC (Table B-4.1). The TPC would evaluate this information, in light of environmental constraints and other known uses of the area, and develop tentative road, pipeline, and power line locations, types, and maintenance information. A draft update with maps would be developed by the TPC and submitted to area Operators and other relevant land users (e.g., grazing permittees, landowners, county and state transportation departments, recreationists) by approximately early November of each year. Meetings would then be held with the TPC and other interested land users to discuss modifications to the proposed update to accommodate Operator and other user concerns. Broad issues potentially affecting most area users would be discussed with the entire TPC, whereas site-specific operation, maintenance, or other specific road problems would be delegated for resolution to subcommittees. Public meetings would be held as deemed necessary by the TPC to present information and solicit additional comment. All issues associated with annual operational updates would be resolved during November and December of each year. A final update that considers all comments would be prepared and available for review in January of each year. Annual operational updates would be available for review at the BLM RFO and RSFO.

Geographic information system (GIS) technologies would be used to assist in the annual updating of the transportation network as appropriate. Maps would be updated to incorporate new sensitive resource locations, proposed roads, wells, pipelines, and ancillary facility locations. Existing roads designated for reclamation also would be identified.

This process would result in minimizing the road densities on the area while accommodating all land user requirements.

Information that may be included in annual operational updates includes:

- the location of all existing wells, roads, pipelines, power lines, and other man-made features on the area;
- the location of all proposed wells, roads, pipelines, power lines, and other project-required features to be developed within the next year;
- the location of all roads to be reclaimed during the next year;
- the anticipated traffic volumes for all existing and proposed developments;
- identification of existing roads that require upgrades to accommodate existing and proposed traffic requirements (careful planning would be required to ensure roads would be neither under- nor over-designed);
- the identification of existing and required maintenance and associated maintenance, ROW, and cooperative agreements (including scheduling, responsible parties, and activities) for project-required roads;
- surfacing material source locations for road upgrades and maintenance;
- the location of sensitive resources (e.g., drainages, raptor nest and sage grouse lek buffers) and environmental obstacles (e.g., steep slopes, erosive soils) (The precise locations of some environmentally sensitive resources [e.g., cultural and paleontological resource sites] may not be presented in updates to avoid unauthorized use; however, the locations of these resources and associated buffers would be considered during the planning process.); and
- other identified transportation issues.

Table B-4.1 Annual Operational Update Responsibilities and Dates, Continental Divide/Wamsutter II Natural Gas Project, 1999.

Action	Responsibility	Approximate Submittal/ Completion Date
Provision of information regarding annual proposed well, road, and facility site locations with traffic requirements; wells and roads to be abandoned; major pipeline and power line projects; road upgrades; landowner concerns; and other issues	Operators, TPC, BLM, other interested parties	Mid-October
Development of agenda; evaluation of proposed plans; preparation of updated maps; and review of updates and other issues	TPC, BLM, Operators	Late October/ Early November
Public meetings to review development plans and associated issues	TPC, BLM, Operators, other interested parties	Early November
Resolution of issues by TPC	TPC, BLM, Operators, other interested parties	November/December
Final update completion/public meetings to discuss resolution measures	TPC, BLM, Operators, other interested parties	Early January

Final road location and design criteria for roads which either cross federal lands or are associated with federal wells would be included in Application for Permit to Drill (APD) and/or ROW applications and would be subject to independent environmental reviews and *National Environmental Policy Act* (NEPA) analysis by BLM. Some modification to proposed road locations specified in annual updates likely would occur as a result of these environmental analyses. For example, Class III cultural resource inventories would be required for all new roads, and these inventories may reveal the potential for significant cultural resource concerns in some areas. Roads would likely be rerouted to avoid such features. Once a road has been constructed, its final location would be identified on maps provided in the annual operational updates.

During the later years of the project (years 30-50), it is anticipated that annual updates primarily would identify well locations, ROWs, and other routes designated for abandonment and reclamation. The ultimate transportation network on the TPA is anticipated to appear much like the area appeared prior to natural gas development. However, public input received during the annual update process may recommend that some roads developed for the proposed project remain after the LOP. New roads that remain after the LOP would become the responsibility of BLM and/or private landowner. In addition, road upgrades of primary access routes would probably remain, and most resource roads developed for this project probably would be reclaimed unless they are determined necessary for other area uses as identified during annual planning.

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B-5.0 LITERATURE CITED

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APPENDIX C:

HAZARDOUS MATERIALS
(Adapted from BLM 1998a)

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Table C.1 Hazardous and Extremely Hazardous Materials Potentially Utilized or Produced During Construction, Drilling, Production, and Reclamation Operations by the Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Source	Approximate Quantities Used or Produced Per Well[1]	Hazardous Substances[2]	Extremely Hazardous Substances[3]	CAS No.
Drilling Materials				
Barite	16,000 lbs	Barium compounds		–
		Fine mineral fibers		–
Bentonite	45,000 lbs	Fine mineral fibers		–
Caustic soda	750 lbs	Sodium hydroxide		1310-73-2
Glutaraldehyde	20 gal	Isopropyl alcohol		67-63-0
Lime	3,500 lbs	Calcium hydroxide		1305-62-0
Mica	600 lbs	Fine mineral fibers		–
Modified tannin	250 lbs	Ferrous sulfate		7720-78-7
		Fine mineral fibers		–
Phosphate esters	100 gal	Methanol		67-56-1
Polyacrylamides	100 gal		Acrylamide	79-06-1
		PAHs[4]		–
		Petroleum distillates		64742-47-8
		POM[5]		–
Retarder	400 lbs	Fine mineral fibers		–
Cementing and Plugging Materials				
Anti-foamer	100 lbs	Glycol ethers		–
Calcium chloride flake	2,500 lbs	Fine mineral fibers		–
Cellophane flake	300 lbs	Fine mineral fibers		–
Cements	77,000 lbs	Aluminum oxide		1344-28-1
		Fine mineral fibers		–
Chemical wash	850 gal	Ammonium hydroxide		1336-21-6
		Glycol ethers		–
Diatomaceous earth	1,000 lbs	Fine mineral fibers		–
Extenders	17,500 lbs	Aluminum oxide		1344-28-1
		Fine mineral fibers		–
Fluid loss additive	900 lbs		Acrylamide	79-06-1
		Fine mineral fibers		–
		Napthalene		91-20-3
Friction reducer	160 lbs	Fine mineral fibers		–
		Napthalene		91-20-3
		PAHs		–
		POM		–
Mud flush	250 lbs	Fine mineral fibers		–
Retarder	100 lbs	Fine mineral fibers		–
Salt	2,570 lbs	Fine mineral fibers		–
Silica flour	4,800 lbs	Fine mineral fibers		–

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Table C.1 (Continued)

Source	Approximate Quantities Used or Produced Per Well[1]	Hazardous Substances[2]	Extremely Hazardous Substances[3]	CAS No.
Fracturing Materials				
Biocides	6 gal	Fine mineral fibers		–
		PAHs		–
		POM		–
Breakers	145 lbs	Ammonium persulphate		7727-54-0
		Ammonium sulphate		7783-20-2
		Copper compounds		–
		Ethylene glycol		107-21-1
		Fine mineral fibers		–
		Glycol ethers		–
Clay stabilizer	50 gal	Fine mineral fibers		–
		Glycol ethers		–
		Isopropyl alcohol		67-63-0
		Methanol		67-56-1
		PAHs		–
		POM		–
Crosslinkers	60 gal	Ammonium chloride		12125-02-9
		Methanol		67-56-1
		Potassium hydroxide		1310-58-3
		Zirconium nitrate		13746-89-9
		Zirconium sulfate		14644-61-2
Foaming agent	120 gal	Glycol ethers		–
Gelling agent	950 gal	Benzene		71-43-2
		Ethylbenzene		100-41-4
		Methyl tert-butyl ether		1634-04-4
		Napthalene		91-20-3
		PAHs		–
		POM		–
		Sodium hydroxide		1310-73-2
		Toluene		108-88-3
		m-Xylene		108-38-3
		o-Xylene		95-47-6
		p-Xylene		106-42-3
pH buffers	60 gal	Acetic acid		64-19-7
		Benzoic acid		65-85-0
		Fumaric acid		110-17-8
		Hydrochloric acid		7647-01-0
		Sodium hydroxide		1310-73-2
Sands	2,000,000 lbs	Fine mineral fibers		–
Solvents	50 gal	Glycol ethers		–
Surfactants	15 gal	Glycol ethers		–
		Isopropyl alcohol		67-63-0
		Methanol		67-56-1
		PAHs		–
		POM		–

Table C.1 (Continued)

Source	Approximate Quantities Used or Produced Per Well[1]	Hazardous Substances[2]	Extremely Hazardous Substances[3]	CAS No.
Production Products				
Natural gas	0.25->3.5 mmcfd	n-Hexane		110-54-3
		PAHs		–
		POM		–
Liquid hydrocarbons	<5-350 bpd	Benzene		71-43-2
		Ethyl benzene		100-41-4
		n-Hexane		110-54-3
		PAHs		–
		POM		–
		Toluene		108-88-3
		m-Xylene		108-33-3
		o-Xylene		95-47-6
		p-Xylene		106-42-3
Produced water/drill cuttings	<20 bpd water and an unknown quantity of cuttings	Barium		7440-39-3
		Cadmium		7440-43-9
		Chromium		7440-47-3
		Lead		7439-92-1
		Manganese		7439-96-5
		Radium 226		–
		Uranium		–
		Other radionuclides		–
Fuels				
Diesel fuel	>36,300 gal	Benzene		71-43-2
		Cumene		98-82-8
		Ethylbenzene		100-41-4
		Methyl tert-butyl ether		1634-04-4
		Naphthalene		91-20-3
		PAHs		–
		POM		–
		Toluene		108-88-3
		m-Xylene		108-38-3
		o-Xylene		95-47-6
		p-Xylene		106-42-3
Gasoline	Unk	Benzene		71-43-2
		Cumene		98-82-8
		Cyclohexane		110-82-7
		Ethylbenzene		100-41-4
		n-Hexane		110-54-3
		Methyl tert-butyl ether		1634-04-4
		Naphthalene		91-20-3
		PAHs		–
		POM		–
			Tetraethyl lead	78-00-2
		Toluene		108-88-3
		m-Xylene		108-38-3
		o-Xylene		95-47-6
		p-Xylene		106-42-3

Table C.1 (Continued)

Source	Approximate Quantities Used or Produced Per Well[1]	Hazardous Substances[2]	Extremely Hazardous Substances[3]	CAS No.
Jet A	Unk	Benzene		71-43-2
		Cumene		98-82-8
		Cyclohexane		110-82-7
		Ethylbenzene		100-41-4
		n-Hexane		110-54-3
		Methyl tert-butyl ether		1634-04-4
		Naphthalene		91-20-3
		PAHs		–
		POM		–
		Toluene		108-88-3
		m-Xylene		108-38-3
		o-Xylene		95-47-6
		p-Xylene		106-42-3
Natural gas	Unk	n-Hexane		110-54-3
		PAHs		–
		POM		–
Propane	Unk	Propylene		115-07-1
Geophysical Survey Materials				
Explosives, fuses, detonators, boosters, fuels	Unk	Aluminum		7429-90-5
		Ammonium nitrate		6484-52-2
		Benzene		71-43-2
		Cumene		98-82-8
		Ethylbenzene		100-41-4
		Ethylene glycol		107-21-1
		Lead compounds		7439-92-1
		Methyl tert-butyl ether		1634-04-4
		Naphthalene		91-20-3
		Nitric acid		7697-37-2
		Nitroglycerine		55-63-0
		PAHs		–
		POM		–
		Toluene		108-88-3
		m-Xylene		108-38-3
		o-Xylene		95-47-6
		p-Xylene		106-42-3
Pipeline Materials				
Coating	Unk	Aluminum oxide		1334-28-1
Cupric sulfate solution	Unk	Cupric sulfate		7758-98-7
		Sulfuric acid		7664-93-9
Diethanolamine	Unk	Diethanolamine		111-42-2
LP Gas	Unk	Benzene		71-43-2
		n-Hexane		110-54-3
		Propylene		115-07-1
Molecular sieves	Unk	Aluminum oxide		1344-28-1
Pipeline primer	Unk	Naphthalene		91-20-3
		Toluene		108-88-3
Potassium hydroxide solution	Unk	Potassium hydroxide		1310-58-3

Table C.1 (Continued)

Source	Approximate Quantities Used or Produced Per Well[1]	Hazardous Substances[2]	Extremely Hazardous Substances[3]	CAS No.
Rubber resin coatings	Unk	Acetone		67-64-1
		Coal tar pitch		68187-57-5
		Ethyl acetate		141-78-6
		Methyl ethyl ketone		78-93-3
		Toluene		108-88-3
		Xylene		1330-20-7
Emissions				
Gases	127 tons[6]	Formaldehyde		50-00-0
			Nitrogen dioxide	10102-44-0
			Ozone	10028-15-6
			Sulfur dioxide	7446-09-5
			Sulfur trioxide	7446-11-9
Hydrocarbons	492 tons[7]	Benzene		71-43-2
		Ethylbenzene		100-41-4
		n-Hexane		100-54-3
		PAH		–
		Toluene		108-88-3
		m-Xylene		108-38-3
		o-Xylene		95-47-6
		p-Xylene		106-42-3
Particulate matter	24 tons[8]	Barium		7440-39-3
		Cadmium		7440-43-9
		Copper		7440-50-8
		Fine mineral fibers		–
		Lead		7439-92-1
		Manganese		7439-96-5
		Nickel		7440-02-0
		POM		–
		Zinc		7440-66-6
Miscellaneous Materials				
Acids	Unk	Acetic anhydride		108-24-7
		Formic acid		64-18-6
		Sodium chromate		777-11-3
		Sulfuric acid		7664-93-9
Antifreeze, heat control, and dehydration agents	300 gal	Acrolein		107-02-8
		Cupric sulfate		7758-38-7
		Ethylene glycol		107-21-1
		Freon		76-13-1
		Phosphoric acid		766-38-2
		Potassium hydroxide		1310-58-3
		Sodium hydroxide		1310-73-2
		Triethylene glycol		112-27-6
Batteries	Unk	Cadmium		7440-43-9
		Cadmium oxide		1306-19-0
		Lead		7439-92-1
		Nickel hydroxide		7440-02-0
		Potassium hydroxide		1310-58-3
		Sulfuric acid		7664-93-9
Biocides	Unk	Formaldehyde		50-00-0
		Isopropyl alcohol		67-63-0
		Methanol		67-56-1
Cleaners	Unk	Hydrochloric acid		7647-01-0

Table C.1 (Continued)

Source	Approximate Quantities Used or Produced Per Well[1]	Hazardous Substances[2]	Extremely Hazardous Substances[3]	CAS No.
Corrosion inhibitors	Unk	4-4' methylene dianiline		101-77-9
		Acetic acid		64-19-7
		Ammonium bisulfite		10192-30-0
		Basic zinc carbonate		3486-35-9
		Diethylamine		109-89-7
		Dodecylbenzenesulfonic acid		27176-87-0
		Ethylene glycol		107-21-1
		Isobutyl alcohol		78-83-1
		Isopropyl alcohol		67-63-0
		Methanol		67-56-1
		Napthalene		91-20-3
		Sodium nitrite		7632-00-0
		Toluene		108-88-3
		Xylene		1330-20-7
Emulsion breakers	Unk	Acetic acid		64-19-7
		Acetone		67-64-1
		Ammonium chloride		12125-02-9
		Benzoic acid		65-85-0
		Isopropyl alcohol		67-63-0
		Methanol		67-56-1
		Napthalene		91-20-3
		Toluene		108-88-3
		Xylene		1330-20-7
		Zinc chloride		7646-85-7
Fertilizers	Unk	Unk		–
Herbicides	Unk	Unk		–
Lead-free thread compound	25 gal	Copper		7440-50-8
		Zinc		7440-66-6
Lubricants	Unk	1,2,4-trimethylbenzene		95-63-6
		Barium		7440-39-3
		Cadmium		7440-43-9
		Copper		7440-50-8
		n-Hexane		110-54-3
		Lead		7439-92-1
		Manganese		7439-96-5
		Nickel		7440-02-0
		PAHs		–
		POM		–
		Zinc		7440-66-6
Methanol	200 gal	Methanol		67-56-1
Motor oil	220 gal	Zinc compounds		–
Paints	Unk	Aluminum		7429-90-5
		Barium		7440-39-3
		n-Butyl alcohol		71-36-3
		Cobalt		7440-48-4
		Lead		7439-92-1
		Manganese		7439-96-5
		PAHs		–
		POM		–
		Sulfuric acid		7664-93-9
		Toluene		108-88-3
		Triethylamine		121-44-8
		Xylene		1330-20-7

Table C.1 (Continued)

Source	Approximate Quantities Used or Produced Per Well[1]	Hazardous Substances[2]	Extremely Hazardous Substances[3]	CAS No.
Paraffin control	Unk	Carbon disulfide		75-15-0
		Ethylbenzene		100-41-4
		Methanol		67-56-1
		Toluene		108-88-3
		Xylene		1330-20-7
Photoreceptors	Unk	Selenium		7782-49-2
Scale inhibitors	Unk	Acetic acid		64-19-7
		Ethylene diamine tetra		60-00-4
		Ethylene glycol		107-21-1
		Formaldehyde		50-00-0
		Hydrochloric acid		7647-01-0
		Isopropyl alcohol		67-63-1
		Methanol		67-56-1
		Nitrilotriacetic acid		139-13-9
Sealants	Unk	1,1,1-trichloroethane		71-55-6
		n-Hexane		110-54-3
		PAHs		–
		POM		–
Solvents	Unk	1,1,1-trichloroethane		71-55-6
		Acetone		67-64-1
		t-Butyl alcohol		75-65-0
		Carbontetrachloride		56-23-5
		Isopropyl alcohol		67-63-0
		Methyl ethyl ketone		108-10-1
		Methanol		67-56-1
		PAHs		–
		POM		–
		Toluene		108-88-3
		Xylene		1330-20-7
Starting fluid	Unk	Ethyl ether		60-29-7
Surfactants	Unk	Ethylene diamine		107-15-3
		Isopropyl alcohol		67-56-1
		Petroleum naphtha		8030-30-6

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[1] lbs = pounds; gal = gallons; bpd = barrels per day; mmcfd = million cubic feet per day; Unk = unknown quantities to be listed based on information availability.

[2] Hazardous substances are those constituents listed under the Consolidated List of Chemicals Subject to Reporting Under Title III of SARA, as amended.

[3] Extremely hazardous substances are those defined in 40 C.F.R. 355.

[4] PAHs = polynuclear aromatic hydrocarbons

[5] POM = polycyclic organic matter

[6] Value includes nitrogen oxides (NO_x) (107 tons per well) and sulfur dioxide (SO_2) (20 tons per well) emission estimates only, as adapted from BLM (1996b).

[7] Value includes volatile organic compound (VOC) emission estimates only, as adapted from BLM (1996b).

[8] Value includes particulate matter less than 10 microns diameter (PM_{10}) emission estimates only, as adapted from BLM (1996b).

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APPENDIX D:

WILDLIFE PROTECTION PLAN

WILDLIFE PROTECTION PLAN,
CONTINENTAL DIVIDE/WAMSUTTER II EIS

Prepared for

U.S. Bureau of Land Management
Rawlins Field Office
Rawlins, Wyoming

and

Rock Springs Field Office
Rock Springs, Wyoming

By

TRC Mariah Associates Inc.
Laramie, Wyoming
MAI Project 1295

April 1999

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ABBREVIATIONS AND ACRONYMS

ANS	**Artificial nesting structures**
APD	**Application for Permit to Drill**
APLIC	**Avian Powerline Interaction Committee**
BLM	**Bureau of Land Management**
CD/WIIPA	**Continental Divide/Wamsutter II Project Area**
CSU	**Controlled Surface Use**
EIS	**Environmental impact statement**
ft	**Foot (feet)**
GIS	**Geographic Information System**
LOP	**Life-of-project**
mi	**Mile(s)**
ROW	**Right-of-way**
SRA	**Sensitive resource area**
TEC&SC	**Threatened, endangered, candidate and other species of concern**
USFWS	**U.S. Fish and Wildlife Service**
USGS	**U.S. Geological Survey**
WDEQ-LQD	**Wyoming Department of Environmental Quality, Land Quality Division**
WGFD	**Wyoming Game and Fish Department**
WNDDB	**Wyoming Natural Diversity Database**

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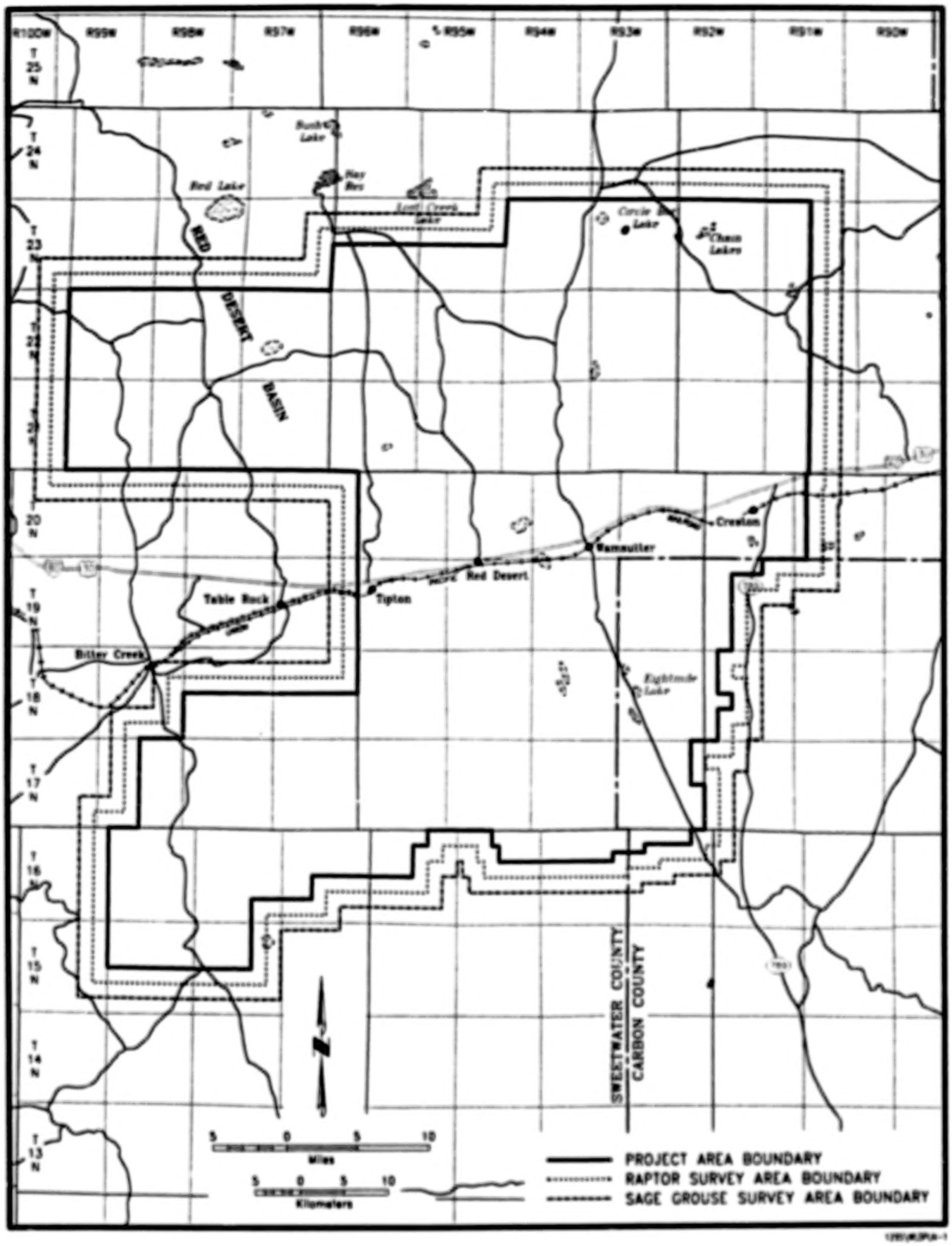
D-1.0 INTRODUCTION

This wildlife monitoring/protection plan was prepared in conjunction with the environmental impact statement (EIS) for the Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming. The goal of the plan is to avoid and/or minimize adverse impacts to wildlife present on project-affected areas by monitoring wildlife population trends on the Continental Divide/Wamsutter II Project Area (CD/WIIPA) during the course of project development and operations and by developing appropriate mitigative actions. Map D-1.1 shows the location of the CD/WIIPA and associated wildlife monitoring areas. Implementation of the plan would allow land managers and project personnel opportunities to achieve and maintain desired levels of wildlife productivity and populations on the CD/WIIPA (e.g., at pre-project levels) by minimizing and/or avoiding potential adverse impacts to wildlife species. In addition, the implementation of this plan would facilitate the maintenance of a diverse assemblage of wildlife populations on the CD/WIIPA simultaneously with the development of natural gas reserves.

The proposed Continental Divide/Wamsutter II Natural Gas Project involves the development of a maximum of 3,000 new well locations and associated facilities (roads, pipelines, compressor stations) on the CD/WIIPA over the next 20 years. The proposed life-of-project (LOP) is estimated to be from 30 to 50 years. Alternative development strategies also have been proposed (i.e., Proposed Action, 14-acre maximum surface disturbance per federally managed section in sensitive resource areas [SRAs], 30-acre maximum surface disturbance per federally managed section in SRAs, No Action). A complete description of the proposed project and alternatives is provided in Chapter 2.0 of the EIS.

Proposed inventory, monitoring, and protection measures would be implemented under each potential development scenario (i.e., alternative), unless information revealed in the coordinated review of annual wildlife reports (see Section D-2.1.1) indicates these measures are unnecessary for wildlife protection. This wildlife plan would not be implemented under the No Action Alternative.

Implementation of the plan would begin in 1999, and it is estimated that implementation would continue for a maximum of 21 years; however, the plan may be terminated at the end of any year when there is sufficient evidence that wildlife populations and productivity in the CD/WIIPA have been successfully protected. The plan would receive a major review for effectiveness every 5 to 6 years (i.e, years 6, 11, 16, and 21 during implementation).



Map D-1.1 Wildlife Survey Areas, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

D-2.0 IMPLEMENTATION PROTOCOL

This section provides preliminary wildlife inventory, monitoring, and protection protocol. A summary of primary protocol components is provided in Table D-2.1. Additional inventory, monitoring, and protection measures are provided for areas of intense development in Table D-2.2. Standard protocol for Application for Permit to Drill (APD) and right-of-way (ROW) application field reviews are provided in Table D-2.3. Alternative protocols likely would be developed in the future in response to specific needs identified in annual wildlife reports (see Section D-2.1.1). Methods are provided for each wildlife species/category, and additional species/categories may be added based on needs identified in annual wildlife reports. The wildlife species/categories for which specific inventory, monitoring, and protection procedures would be applied were developed based on management agency (i.e., Bureau of Land Management [BLM], U.S. Fish and Wildlife Service [USFWS], Wyoming Game and Fish Department [WGFD]) and individual concerns identified during the preparation of the EIS (see EIS Section 1.4).

While considerable efforts would be required by agency and Operator (e.g., Amoco Production Company, Union Pacific Resources Company, Snyder Oil Corporation, etc.) personnel for plan implementation; it is anticipated that with the newly identified assistance provided by the Operators, this plan could be executed without considerable additional agency commitment. Many of the annually proposed agency data collection activities are consistent with current agency activities. Additionally, during annual planning (see Section D-2.1) and throughout project implementation, all efforts would be made to accommodate agency personnel schedules and responsibilities, and further agency cost-sharing approaches would be considered such that public demands and statutory directives are achieved.

D-2.1 ANNUAL REPORTS AND MEETINGS

D-2.1.1 Reports

During project development (i.e., 15 to 20 years), Operators would provide an annual inventory and description of all existing project features (i.e., location, size, and associated level of human activity at each feature), as well as those tentatively proposed for development during the next 12 months. This inventory would be submitted to the BLM by Operators no later than October 15 of each calendar year. These data would be coupled with annual wildlife inventory, monitoring, and protection data obtained for the previous year and included in annual reports. Annual reports would be prepared by the BLM. When annual wildlife inventory, monitoring, and protection data are gathered by parties other than the BLM, those parties (e.g., Operators, WGFD) would be requested to provide the data to the BLM by October 15 of each calendar year. Upon receipt of these data, annual reports would be completed in draft form by the BLM and submitted to the Operators, USFWS, and other interested parties no later than November 15 of each year. A 1-day meeting of the aforementioned parties would be organized by the BLM and held in early December of each year to discuss and modify, as necessary, proposed wildlife inventory, monitoring, and protection protocol for the subsequent year.

Decisions regarding annual Operator-specific financing and personnel requirements would be made at these meetings, and it is anticipated that a formula for determining these requirements would be developed at the first year's meeting. In addition, a protocol regarding how to accommodate previously unidentified development sites would also be determined during the first year's meeting. Final decisions would be made by the BLM based on the input of all affected parties.

A final annual report would be issued by the BLM to all potentially affected individuals and groups by early February of each year. The first annual report would be submitted by February 15, 2001.

Annual reports would summarize annual wildlife inventory and monitoring results, note any trends across years, identify and assess protection measures implemented during past years, specify monitoring and protection measures proposed for the upcoming year, and recommend modifications to the existing wildlife monitoring/protection plan based on the successes and/or failures of past years (e.g., identification of additional species/categories to be monitored). Where possible, the data presented in reports would be used to identify potential correlations between development and wildlife productivity and/or abundance. Addendum D-A provides examples for the tabular presentation of data within annual reports. The BLM's Geographic Information System (GIS) would be used for

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Table D-2.1 Summary of General Wildlife Reporting, Inventory, and Monitoring, Continental Divide/ Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Action	Dates	Responsible Entity[1]
Annual area-wide tentative plan of development showing locations of existing and newly proposed development features	Annually by October 15	Operators
Annual reports summarizing findings and presenting protection actions	Annually by: Draft - November 15 Final - early February	BLM with reviews by Operators, USFWS, and other interested parties
Meetings to finalize future year's inventory, monitoring, and protection measures	Early December and as necessary	BLM with participation by USFWS, Operators, and other interested parties
Inventory and Monitoring		
Raptor nest inventories (CD/WIIPA plus 1-mi buffer) (excluding burrowing owls)	Every 5 years during April-May	BLM with Operator-provided financial assistance for aircraft rental
Raptor productivity monitoring (at active nests within 1-mi of project-required disturbance areas on the CD/WIIPA plus 1-mi buffer)	Every 5 years during March to mid-July	BLM with Operator-provided financial assistance for aircraft rental, as necessary
Aerial sage grouse lek inventories (CD/WIIPA plus 2-mi buffer)	Every 5 years during March-April	BLM surveyor with Operator-provided financial assistance for aircraft rental
Sage grouse lek attendance monitoring on and within 2 mi of the CD/WIIPA	Annually during March - mid-May	Selected leks would be visited at least once by the BLM, such that all known leks are visited every 3 years
Big game crucial winter range use monitoring (crucial winter range on the CD/WIIPA plus a 1-mi buffer)	As available	BLM will request available data from the WGFD

---

[1] With Operator assistance, it is anticipated that agency obligations would not greatly exceed currently approved personnel or financial commitments.

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Table D-2.2 **Additional Wildlife Inventory and Monitoring Measures On and Adjacent to Areas with High Levels of Development (≥ 4 Locations/Section), Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.**

Action	Dates	Responsible Entity[1]
Raptor nest inventory/monitoring on areas with ≥4 locations/ection plus a 1-mi buffer and selected undeveloped comparison areas	Annually during April and May	BLM surveyor with Operator-provided financial assistance for aircraft rental
Raptor productivity monitoring on areas with ≥4 locations/section plus a 1-mi buffer and selected undeveloped comparison areas	Annually during March-July	BLM surveyor with Operator-provided financial assistance for BLM volunteer support
Selected TEC&SC inventory/monitoring on suitable habitats in areas with ≥4 locations/section plus a 1-mi buffer and selected undeveloped comparison areas	Annually during spring and summer	Operator-financed BLM-approved biologist
Aerial sage grouse lek inventory on areas with ≥4 locations/section plus a 2-mi buffer and selected undeveloped comparison areas	Annually during March-April	BLM surveyor with Operator-provided financial assistance for aircraft rental
Sage grouse lek attendance monitoring on areas with ≥4 locations/section plus a 2-mi buffer and selected undeveloped comparison areas	Annually during March to mid-May	Each known lek would be visited at least once annually by the BLM and/or an Operator-financed BLM-approved biologist; subsequent visits would occur at BLM-selected leks by the BLM, and/or Operator-financed BLM-approved biologist
Other studies on areas with ≥8 locations/section and selected undeveloped comparison areas	Year-long and in any year as deemed necessary by BLM and/or USFWS	USFWS and/or BLM with Operator- and other party-provided financial assistance (Operator assistance would not exceed $5,000 in any year)

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[1] With Operator assistance, it is anticipated that agency obligations would not greatly exceed currently approved personnel or financial commitments.

Table D-2.3 Summary of General APD/ROW Application Stage Survey/Protection Measures, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, 1999.

Protection Measure	Dates	Responsible Entity
APD-stage general raptor nest survey/ inventory within 0.75 to 1.0 mi of proposed disturbance	Yearlong	BLM, Operators
APD-stage seasonal raptor nest avoidance within 0.5 to 1.0 mi of active nests	February 1 - July 31 (seasonal restriction)	Operators, BLM
APD-stage general raptor nest avoidance within 825 ft of active nests (1,200 ft for active ferruginous hawk nests)	Yearlong (Controlled Surface Use [CSU] generally excluding surface disturbance)	Operators, BLM
APD-stage TEC&SC surveys (within 0.5 mi of proposed disturbance sites)	As necessary	BLM or Operators
APD-stage TEC&SC avoidance	As necessary	Operators, BLM
APD-stage prairie dog colony mapping and burrow density determinations	As necessary	Operators, BLM
Black-footed ferret habitat (i.e., prairie dog colony) avoidance	Where practical	Operators, BLM
Black-footed ferret surveys where suitable habitat must be disturbed	As necessary in appropriate season no more than 1 year prior to disturbance	Operator-financed USFWS-approved biologist
APD-stage mountain plover surveys (within 0.25 mi of proposed well locations or 300 ft of proposed roads)	As necessary between March 15 and August 15	BLM or Operator-financed BLM-approved biologist
Mountain plover nest/brood avoidance	As necessary	Operators, BLM
APD-stage western burrowing owl surveys (within 0.5 mi of proposed disturbance sites)	As necessary during June-August	BLM or Operator-financed BLM-approved biologist
Western burrowing owl nest avoidance	As necessary	Operators, BLM
APD-stage sage grouse lek surveys on suitable habitats within 2 mi of proposed disturbance sites	March 1 - mid-May	Operators, BLM
APD-stage sage grouse lek avoidance on areas within 2.0 mi of a lek	March 1 - June 30	Operators, BLM
APD-stage sage grouse lek avoidance on areas within 0.25 mi of a lek	Yearlong (CSU generally excluding surface disturbance)	Operators, BLM
APD-stage sage grouse nest avoidance	As necessary	Operators, BLM
Big game crucial winter range avoidance	November 15 - April 30	Operators, BLM
APD-stage general wildlife avoidance/protection	As necessary	Operators, USFWS, BLM

information storage, retrieval, and planning, and annual GIS data updates would be conducted. Raw data collected each year also would be provided to other management agencies (e.g., WGFD, USFWS, Wyoming Natural Diversity Database [WNDDB]) at the request of these agencies. In addition, sources of potential disturbance to wildlife would be identified, where practical (e.g., development activities, weather conditions, etc.).

Additional reports may be prepared in any year, as necessary, to comply with other relevant wildlife laws, rules, and regulations (e.g., black-footed ferret survey reports [see Section D-2.2.2.1]).

D-2.1.2 Additional Meetings

Meetings would be held as necessary in any given year by the BLM, Operators, and/or USFWS in Rawlins to inform and update Operator personnel on the findings of the annual reports. Other management agencies and user groups (e.g., WGFD, landowners, grazing permittees, recreationists) would also be invited to attend meetings and cooperate in the implementation of this plan. Relevant wildlife laws, rules, and regulations may be discussed, as would project-specific wildlife monitoring and protection protocol for the upcoming year. Operators and other interested parties would have the opportunity to provide annual input regarding proposed inventory, monitoring, and protection measures; however, the BLM would maintain the authority for determining the final nature of these activities in any given year. Additional information on the nature of the wildlife present in the CD/WIIPA, potential impacts to wildlife, appropriate Operator responses to wildlife encounters to avoid or minimize impacts, and other items (e.g., species identification) also may be presented at these meetings as deemed necessary and specified in annual reports.

D-2.2 ANNUAL INVENTORY AND MONITORING

Inventory and monitoring protocol would be as identified below for each wildlife species/category. These protocol would be unchanged across development alternatives, except as authorized by the BLM or specified in this plan. Additional wildlife species/categories and associated surveys may be added or wildlife species/categories and surveys may be omitted in future years, pending results presented in the coordinated review of annual wildlife reports. The WGFD would be contacted during the coordination of survey and other data acquisition phases. Opportunistic wildlife observations may be made throughout the year by agency and Operator personnel present in the CD/WIIPA.

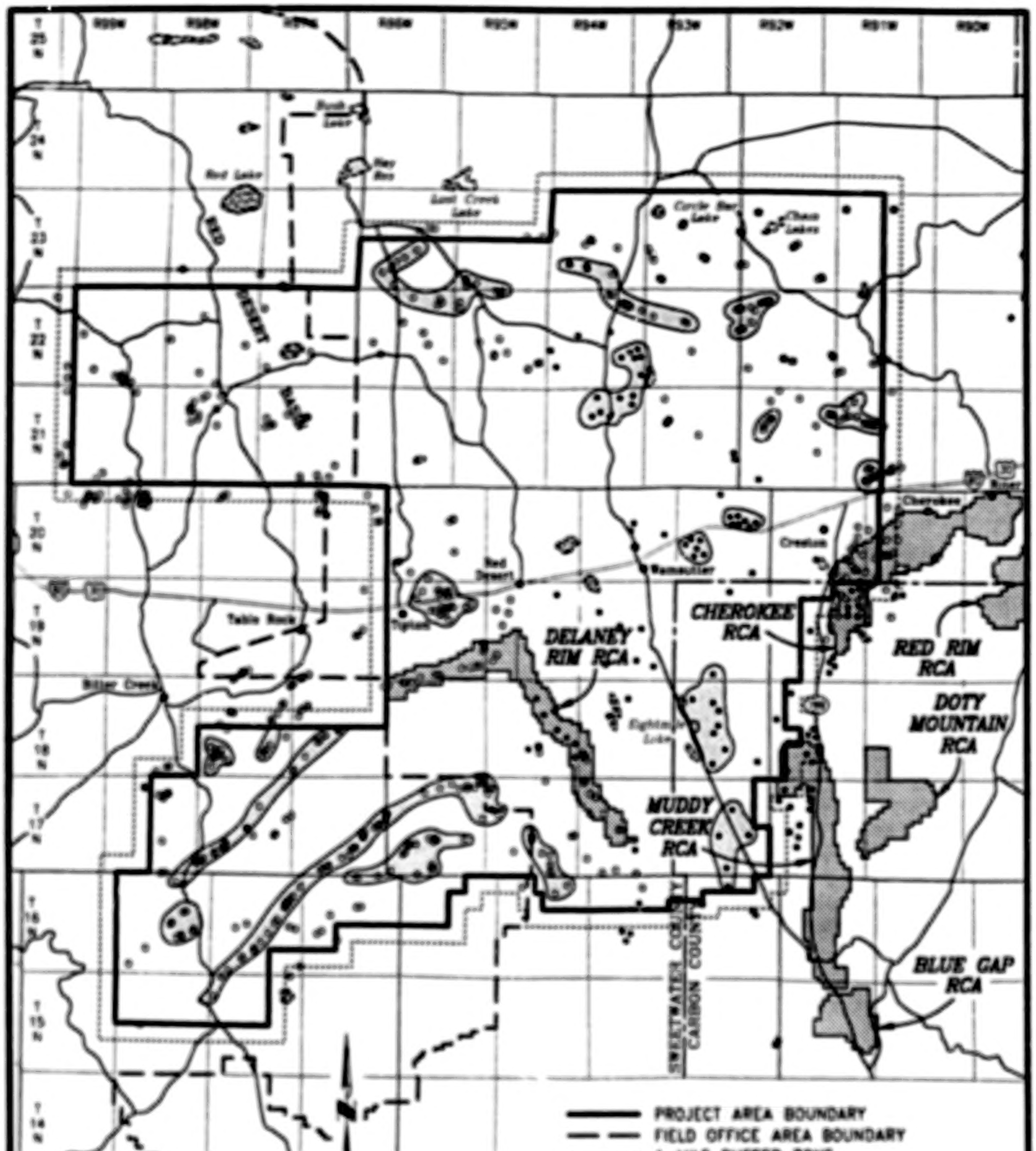
The frequency of inventory and monitoring would be dependent upon the level of development in the CD/WIIPA (see Tables D-2.1 and D-2.2). In general, inventory and monitoring frequency would increase with increased levels of development. Inventory and monitoring results may lead to further currently unidentifiable studies (e.g., scientific studies specifically designed to determine cause and effect). The following sections identify the minimum level of effort required by this wildlife plan. Site- and species-specific surveys would continue to be conducted in association with APD and ROW application field reviews (see Table D-2.3).

D-2.2.1 Raptors

Raptor inventories of potentially affected areas (see Map D-1.1 and Table D-2.1) would be conducted in April/May of 1998 and every 5 years thereafter for the LOP to determine the location of raptor nests/territories and their activity status by the BLM. Known raptor concentration areas and approximate nest locations on and adjacent to the CD/WIIPA are shown on Map D-2.1. These surveys may be implemented aerially (e.g., via helicopter) or from the ground. Operators would provide financial assistance for aircraft rental. Data collected during the surveys would be recorded on Raptor Nesting Record, Raptor Observation Data Sheets, or other similar data forms (see Addendum D-B). (Burrowing owl survey requirements are discussed in Section D-2.2.2.4).

Nest productivity monitoring would be conducted by the BLM at active nests that are located within 1 mi of project-required disturbance areas between March 1 and mid-July to determine nesting success (i.e., number of nestlings/fledglings). These surveys generally would be conducted from the ground, and attempts would be made to determine the cause of any documented nest failure. Operators would provide financial assistance for aircraft rental, as necessary.

Additional raptor nest activity and productivity monitoring measures would be applied in areas with high levels of development (i.e., areas with ≥ 4 locations/section) on and within 1 mi of the CD/WIIPA (see Table D-2.2). Inventory/monitoring efforts in these areas, as well



Map D-2.1 Known Raptor Concentration Areas and Nest Locations, Continental Divide/ Wamsutter II Natural Gas Project Area, Sweetwater and Carbon Counties, Wyoming, 1999.

as selected undeveloped comparison areas, would be conducted annually during April and May, followed by nest productivity monitoring. Site- and species-specific raptor nest inventories would also continue to be conducted as necessary in association with all APD and ROW application field reviews (see Table D-2.3).

All raptor nest/productivity surveys would be conducted using procedures that minimize potential adverse effects to nesting raptors. Specific survey measures for reducing detrimental effects are listed in Grier and Fyfe (1987) and Call (1978) and include the following.

- Nest visits would be delayed for as long as possible in the nesting season.
- Nests would be approached cautiously, and their status (i.e., number of nestlings/fledglings) would be determined from a distance with binoculars or a spotting scope.
- Nests would be approached tangentially and in an obvious manner to avoid startling adults.
- Nests would not be visited during adverse weather conditions (e.g., extreme cold, precipitation events, windy periods, hottest part of the day).
- Visits would be kept as brief as possible and in no instance would be greater than 10 minutes.
- All inventories would be coordinated by the BLM.
- The number of nest visits in any year would be kept to a minimum.
- All raptor nest location data would be considered confidential.

D-2.2.2 Threatened, Endangered, Candidate, and Other Species of Concern

The level of inventory/monitoring required for threatened, endangered, candidate, and other species of concern (TEC&SC) would be commensurate with established protocol for the potentially affected species. Survey protocol developed in conjunction with the Biological Assessment for this project (see EIS Appendix E) would be conducted as a component of this wildlife protection plan. Methodologies and results of these surveys would be included in annual reports or provided in separate supplemental reports. A preliminary list of TEC&SC species proposed for management and known from or potentially occurring in the vicinity of the CD/WIIPA is shown on Table D-2.4. As TEC&SC species are added to or withdrawn from USFWS, BLM, and/or WGFD lists, appropriate modifications would be incorporated to this plan and specified in annual reports. Additional species of concern known from or potentially occurring in the vicinity of the CD/WIIPA are shown on Table D-2.5.

TEC&SC data collected during the surveys identified in Tables D-2.2 and D-2.3 and described below would be considered confidential and would be provided only as necessary to those requiring the data for specific management and/or project development needs. Site- and species-specific TEC&SC surveys would continue to be conducted as necessary in association with all APD and ROW application field reviews (see Table D-2.3). Data would be collected on appropriate General Wildlife Observation Data Sheets or other similar forms (see Addendum D-B). Alternate/additional forms may be used as specified by the BLM.

D-2.2.2.1 Black-footed Ferret

BLM-approved Operator-financed biologists would determine the presence/absence of prairie dog colonies at each proposed development site during APD and ROW application field revisions (see Table D-2.3). Sections with current and/or historic prairie dog colonies are shown on Map D-2.2. Prairie dog colonies (i.e., potential black-footed ferret habitat) on the area would be mapped and burrow densities determined by a BLM-approved Operator-financed biologist, as necessary and in association with proposed development plans (i.e., APD and ROW application reviews). Colonies that meet USFWS criteria as potential black-footed ferret habitat (USFWS 1989) would be surveyed for black-footed ferrets by an USFWS-certified Operator-financed surveyor prior to BLM authorizing disturbance of these colonies. Surveys would only be conducted as deemed necessary during consultation with the BLM and/or USFWS. Black-footed ferret surveys would be conducted in accordance with USFWS guidelines (USFWS 1989) and would be conducted on a site-specific basis, depending on the areas proposed for disturbance in a given year as specified in the annual report.

D-2.2.2.2 Bald Eagle, Peregrine Falcon, and Ferruginous Hawk

Inventory and monitoring protocol for bald eagle, peregrine falcon, and ferruginous hawk would be as described for raptors (see Section D-2.2.1).

Table D-2.4 Threatened, Endangered, Candidate, and Species of Concern Proposed for Management and Documented or Potentially Occurring on or in the Vicinity of the Continental Divide/Wamsutter II Natural Gas Project Area, 1999.[1]

Species		**Status[2, 3]**				**Documented on or in Vicinity of the CD/WIIPA[4]**	**Habitat Type(s)[5]**
Common Name	**Scientific Name**	**USFWS**	**BLM**	**WGFD**	**WNDDB**		
Peregrine falcon	***Falco peregrinus***	**LE**	**X**	**X**	**X**	**Yes[6]**	**UB**
Whooping crane	***Grus americana***	**LE**	**X**	**X**	**X**	**No**	**FT**
Black-footed ferret	***Mustela nigripes***	**LE**	**X**	**X**	**X**	**Yes[7]**	**BS, BG, SB, DS, MG**
Bald eagle	***Haliaeetus leucocephalus***	**LT**	**X**	**X**	**X**	**Yes**	**UB**
Mountain plover	***Charadrius montanus***	**C**	**X**	**X**	**X**	**Yes[6]**	**DS, MG**
Swift fox	***Vulpes velox***	**C**	**X**	**X**	**X**	**Yes[7]**	**MG, SR**
Northern goshawk	***Accipiter gentilis***	**SC**	**X**	**X**	**X**	**Yes[6]**	**FT**
Ferruginous hawk	***Buteo regalis***	**SC**	**X**	**X**	**X**	**Yes[6]**	**UB**
Western burrowing owl	***Athene cunicularia hypugaea***	**SC**	**X**	**–**	**X**	**Yes[6]**	**BS, BG, SB, DS, MG**
Loggerhead shrike	***Lanius ludovicianus***	**SC**	**X**	**–**	**X**	**Yes[6]**	**UB**
Turkey vulture	***Cathartes aura***	**–**	**X**	**–**	**–**	**Yes[6]**	**UB**
Osprey	***Pandion haliaetus***	**–**	**X**	**–**	**–**	**No**	**FT**
Northern harrier	***Circus cyaneus***	**–**	**X**	**–**	**–**	**Yes[6]**	**UB**
Sharp-shinned hawk	***Accipiter striatus***	**–**	**X**	**–**	**–**	**Yes[6]**	**FT**
Cooper's hawk	***Accipiter cooperii***	**–**	**X**	**–**	**–**	**Yes[6]**	**FT**
Swainson's hawk	***Buteo swainsoni***	**–**	**X**	**–**	**–**	**Yes[6]**	**PJ, SR**
Red-tailed hawk	***Buteo jamaicensis***	**–**	**X**	**–**	**–**	**Yes[6]**	**UB**
Rough-legged hawk	***Buteo lagopus***	**–**	**X**	**–**	**–**	**Yes**	**UB**
Golden eagle	***Aquila chrysaetos***	**–**	**X**	**–**	**–**	**Yes[6]**	**UB**
American kestrel	***Falco sparverius***	**–**	**X**	**–**	**–**	**Yes[6]**	**UB**
Merlin	***Falco columbarius***	**–**	**X**	**X**	**X**	**Yes[6]**	**UB**
Prairie falcon	***Falco mexicanus***	**–**	**X**	**–**	**–**	**Yes[6]**	**UB**

Table D-2.4 (Continued)

Species		Status[2, 3]				Documented on or in Vicinity of the CD/WIIPA[4]	Habitat Type(s)[5]
Common Name	Scientific Name	USFWS	BLM	WGFD	WNDDB		
Barn owl	*Tyto alba*	–	X	–	X	Yes	UB
Great horned owl	*Bubo virginianus*	–	X	–	–	Yes[6]	UB
Long-eared owl	*Asio otus*	–	X	–	–	Yes[6]	UB
Short-eared owl	*Asio flammeus*	–	X	–	–	Yes[6]	UB
Common loon	*Gavia immer*	–	X	X	X	Yes	FT (SR)
American white pelican	*Pelecanus erythrorhynchos*	–	X	X	X	Yes	SR
American bittern	*Botaurus lentiginosus*	–	X	X	X	Yes	FT (SR)
Snowy egret	*Egretta thula*	–	X	X	X	Yes	FT (SR)
Black-crowned night heron	*Nycticorax nycticorax*	–	X	X	X	Yes	FT (SR)
Long-billed curlew	*Numenius americanus*	–	X	X	X	Yes[6]	BS, SR, MG
Caspian tern	*Sterna caspia*	–	X	X	X	Yes	FT (SR)
Forster's tern	*Sterna forsteri*	–	X	X	X	Yes	FT (SR)
Yellow-billed cuckoo	*Coccyzus americanus*	–	X	X	X	No	FT
Lewis' woodpecker	*Melanerpes lewis*	–	X	X	X	Yes[6]	SR, PJ
Ash-throated flycatcher	*Myiarchus cinerascens*	–	X	X	X	Yes[6]	PJ, FT
Scrub jay	*Aphelocoma coerulescens*	–	X	X	X	Yes[6]	PJ, FT
Plain titmouse	*Parus inornatus*	–	X	X	X	Yes[6]	PJ, FT
Bushtit	*Psaltriparus minimus*	–	X	X	X	Yes[6]	PJ, FT
Scott's oriole	*Icterus parisorum*	–	X	X	X	Yes[6]	PJ, FT
Dwarf shrew	*Sorex nanus*	–	X	X	X	Yes[6]	UB
Vagrant shrew	*Sorex vagrans*	–	X	X	–	No	SR, BS, SB, BG
Little brown myotis	*Myotis lucifugus*	–	X	X	–	Yes	UB
Big brown bat	*Eptesicus fuscus*	–	X	X	–	Yes	UB

Table D-2.4 (Continued)

Species		Status[2, 3]				Documented on or in Vicinity of the CD/WIIPA[4]	Habitat Type(s)[5]
Common Name	**Scientific Name**	**USFWS**	**BLM**	**WGFD**	**WNDDB**		
Pallid bat	*Antrozous pallidus*	–	X	X	X	Yes	UB
Cliff chipmunk	*Tamias dorsalis*	–	X	X	X	Yes[6]	SR, PJ, BS
Canyon mouse	*Peromyscus crinitus*	–	X	X	X	No	PJ, B/R
Pinyon mouse	*Peromyscus truei*	–	X	X	X	Yes[6]	BS, B/R, PJ
Northern leopard frog	*Rana pipiens*	–	X	X	–	Yes	SR
Northern plateau lizard	*Sceloporus undulatus elongatus*	–	X	X	–	Yes	BS, B/R
Northern tree lizard	*Urosaurus ornatus*	–	X	X	–	Yes	BS, B/R
Great Basin gopher snake	*Pituophis melanoleucus deserticola*	–	X	X	–	Yes	UB
Midget faded rattlesnake	*Crotalus viridis concolor*	–	X	X	–	Yes	BS

[1] Wyoming Natural Diversity Database (WNDDB) searches (1995, 1997); U.S. Fish and Wildlife consultation (1995, 1997); Wyoming Game and Fish Department (WGFD) list of priority species (1997); and Fertig (1997).

[2] USFWS = U.S. Fish and Wildlife Service, WGFD = Wyoming Game and Fish Department, WNDDB = Wyoming Natural Diversity Database, and BLM = Bureau of Land Management.

[3] LE = USFWS listed endangered, LT = USFWS listed threatened, WNDDB; C = USFWS candidate species (proposed threatened), SC = USFWS species of concern, X = given special status by the agency listed (i.e., WGFD, WNDDB, and/or BLM species of concern).

[4] Indicates documentation of amphibian, reptile, or plant species in Sweetwater or Carbon County (Baxter and Stone 1980; Fertig 1997); documentation of bird species within latitude 41°, longitude 107-109° (Dorn and Dorn 1990; WGFD 1992, 1996); and/or documentation of mammal species within latitude 41°, longitude 107-109° (WGFD 1992, 1996).

[5] As described in Section 3.2.1 of the EIS: BS = big sagebrush, BG = black greasewood, DS = desert shrub, B/R = basin/exposed rock, SB = saltbush, SR = shrub-dominated riparian, MG = mixed grass prairie, UP = unvegetated playa, PJ = small pockets of pine and/or juniper woodland, UB = ubiquitous, FT = fly through.

[6] Species has been documented breeding within latitude 41°, longitude 107-109° (Dorn and Dorn 1990; WGFD 1992).

[7] Documentation of historical observation only (WGFD 1992; WNDDB 1995).

Table D-2.5 Other Species of Concern Documented or Potentially Occurring on or in the Vicinity of the Continental Divide/Wamsutter II Natural Gas Project Area, 1999.[1]

Species		**Status**[2, 3]		**Documented on or in Vicinity of the CD/WIIPA**[4]	
Common Name	**Scientific Name**	**USFWS**	**WNDDB**		**Habitat Type(s)**[5]
Western boreal toad	***Bufo boreas boreas***	**SC**	**–**	**Yes**	**SR, P/R**
White-faced ibis	***Plegadis chihi***	**SC**	**–**	**No**	**FT(P/R)**
Trumpeter swan	***Cygnus buccinator***	**SC**	**–**	**Yes**	**FT(P/R)**
Black tern	***Chlidonias niger***	**SC**	**–**	**Yes**	**FT(P/R)**
Small-footed myotis	***Myotis ciliolabrum***	**SC**	**–**	**Yes**	**BS, BG, DS, B/R, SR, MG, PJ**
Long-eared myotis	***Myotis evotis***	**SC**	**–**	**Yes**	**BS, BG, DS, SB, SR, PJ**
Long-legged myotis	***Myotis volans***	**SC**	**–**	**Yes**	**SR, PJ**
Spotted bat	***Euderma maculatum***	**SC**	**–**	**No**	**BS, BG, DS, B/R, SB, P/R**
Townsend's big-eared bat	***Plecotus townsendii***	**SC**	**–**	**Yes**	**DS, PJ**
Pygmy rabbit	***Sylvilagus idahoensis***	**SC**	**–**	**Yes**	**BS, SR**
Eastern shorthorned lizard	***Phrynosoma douglassi brevirostre***	**–**	**X**	**Yes**	**UB**
Northern sagebrush lizard	***Sceloporus graciosus***	**–**	**X**	**Yes**	**BS, BG, SB, DS, B/R**
Columbian sharp-tailed grouse	***Tympanuchus phasianellus columbianus***	**–**	**X**	**Yes**[6]	**BS, BG, SB, SR, MG**
Common tern	***Sterna hirundo***	**–**	**X**	**Yes**	**FT (SR)**
Baird's sparrow	***Ammodramus bairdii***	**–**	**X**	**No**	**FT (MG)**
Horned grebe	***Podiceps auritus***	**–**	**X**	**Yes**	**FT (P/R)**
Red-necked grebe	***Podiceps grisegena***	**–**	**X**	**Yes**	**FT (P/R)**
Clark's grebe	***Aechmophorus clarkii***	**–**	**X**	**Yes**	**FT (P/R)**
Ring-necked duck	***Aythya collaris***	**–**	**X**	**Yes**	**FT (P/R)**
Common goldeneye	***Bucephala clangula***	**–**	**X**	**Yes**	**SR**

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Table D-2.5 (Continued)

Species		Status[1, 2]		Documented on or in Vicinity of the CD/WIIPA[4]	Habitat Type(s)[5]
Common Name	Scientific Name	USFWS	WNDDB		
Bufflehead	*Bucephala albeola*	–	X	Yes	SR
Red-breasted merganser	*Mergus serrator*	–	X	Yes	FT (SR)
Virginia rail	*Rallus limicola*	–	X	Yes[6]	FT (SR)
Western snowy plover	*Charadrius alexandrinus*	–	X	Yes[6]	FT (SR)
Piping plover	*Charadrius melodus*	–	X	Yes	FT
Black-necked stilt	*Himantopus mexicanus*	–	X	Yes[6]	FT (SR)
Upland sandpiper	*Bartramia longicauda*	–	X	Yes	FT (MG)
Red-necked phalarope	*Phalaropus lobatus*	–	X	Yes	FT (SR)
Franklin's gull	*Larus pipixcan*	–	X	Yes	FT (SR)
Ring-billed gull	*Larus delawarensis*	–	X	Yes	FT
California gull	*Larus californicus*	–	X	Yes	FT
Herring gull	*Larus argentatus*	–	X	Yes	FT (SR)
Black-tailed cuckoo	*Coccyzus erythropthalmus*	–	X	Yes	FT
Black-chinned hummingbird	*Archilochus alexandri*	–	X	Yes[6]	SR, PJ
Three-toed woodpecker	*Picoides tridactylus*	–	X	Yes[6]	FT
Blue-gray gnatcatcher	*Polioptila caerulea*	–	X	Yes[6]	PJ, SR
Eastern bluebird	*Sialia sialis*	–	X	Yes[6]	SR, PJ, MG
Red-eyed vireo	*Vireo olivaceus*	–	X	Yes[6]	FT
Virginia's warbler	*Vermivora virginiae*	–	X	Yes[6]	PJ, FT
Black-throated gray warbler	*Dendroica nigrescens*	–	X	Yes[6]	PJ, FT
Blue grosbeak	*Guiraca caerulea*	–	X	Yes	FT (SR)
Indigo bunting	*Passerina cyanea*	–	X	Yes	BS, BG, SB, SR
Dickcissel	*Spiza americana*	–	X	No	FT
Clay-colored sparrow	*Spizella pallida*	–	X	Yes	FT (SR, PJ)

Table D-2.5 (Continued)

Species		Status[2, 3]		Documented on or in Vicinity of the CD/WIIPA[4]	Habitat Type(s)[5]
Common Name	Scientific Name	USFWS	WNDDB		
Black-throated sparrow	*Amphispiza bilineata*	–	X	No	FT
Chestnut-collared longspur	*Calcarius ornatus*	–	X	Yes	FT
Bobolink	*Dolichonyx oryzivorus*	–	X	Yes[6]	BS, BG, SB, SR, MG
Red bat	*Lasiurus borealis*	–	X	Yes	FT
Hoary bat	*Lasiurus cinereus*	–	X	Yes	UB
Allen's thirteen-lined groundsquirrel	*Spermophilus tridecemlineatus alleni*	–	X	Yes[6]	UB
Spotted ground squirrel	*Spermophilus spilosoma*	–	X	Yes[6]	BS, SB, MG
White-tailed prairie dog	*Cynomys leucurus*	–	X	Yes[6]	BS, BG, SB, DS, MG
Wyoming pocket gopher	*Thomomys clusius*	–	X	Yes[6]	BG, BR, SB, DS
Silky pocket mouse	*Perognathus flavus*	–	X	Yes[6]	UB
Great Basin pocket mouse	*Perognathus parvus*	–	X	Yes[6]	BS, BG, SB, SR
White-footed mouse	*Peromyscus leucopus*	–	X	No	UB
Western spotted skunk	*Spilogale gracilis*	–	X	No	BS, BG, SB, SR, MG

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[1] Wyoming Natural Diversity Database (WNDDB) searches (1995, 1997); U.S. Fish and Wildlife consultation (1995, 1997); Wyoming Game and Fish Department (WGFD) list of priority species (1997);and Fertig (1997).

[2] USFWS = U.S. Fish and Wildlife Service, WNDDB = Wyoming Natural Diversity Database.

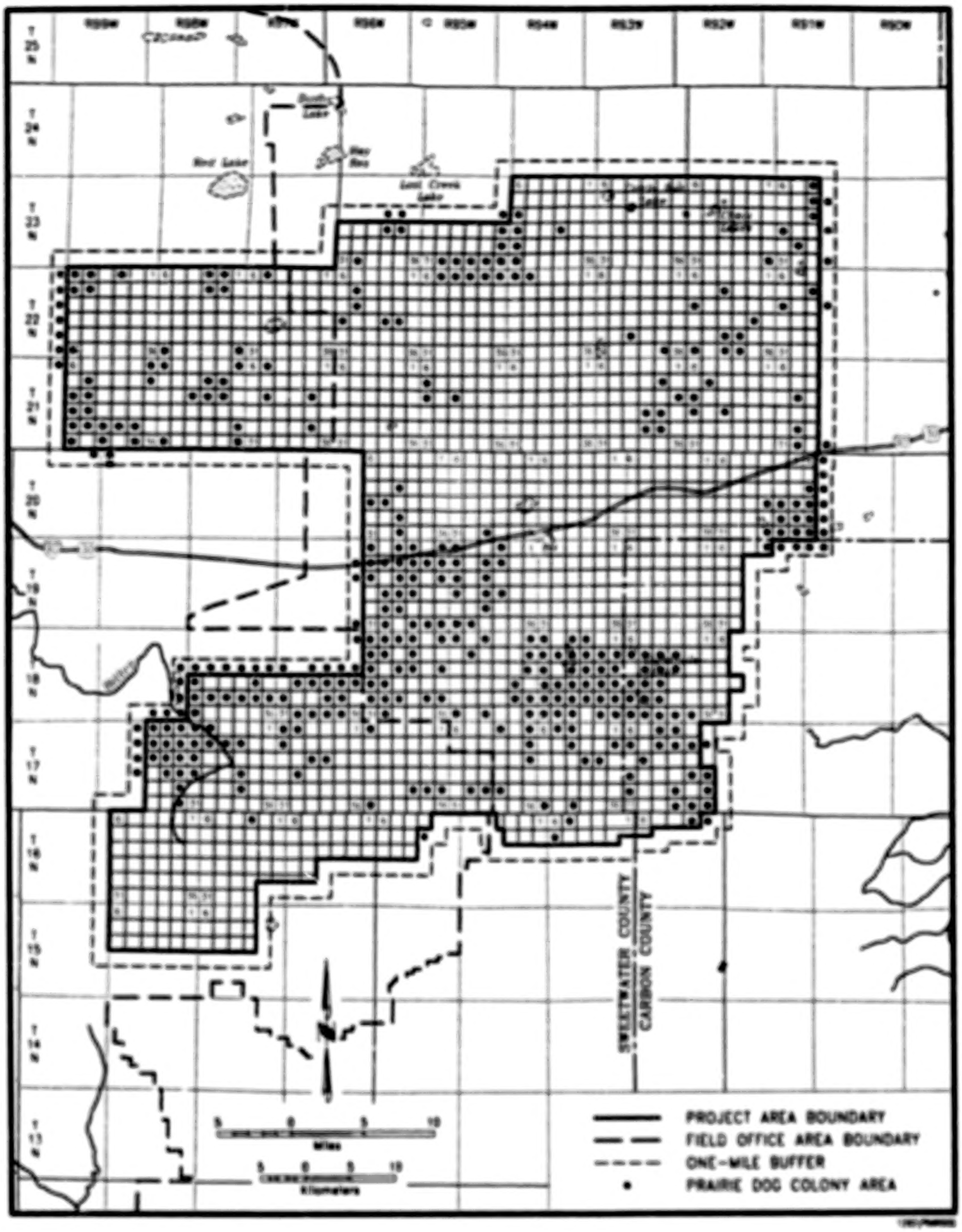
[3] SC = USFWS species of concern, X = given special status by the agency listed (i.e., USFWS, WNDDB).

[4] Indicates documentation of amphibian, reptile, or plant species in Sweetwater or Carbon County (Baxter and Stone 1980; Fertig 1997); documentation of bird species within latitude 41°, longitude 107-109° (Dorn and Dorn 1990; WGFD 1992, 1996); and/or documentation of mammal species within latitude 41°, longitude 107-109° (WGFD 1992, 1996).

[5] As described in Section 3.2.1 of the EIS: BS = big sagebrush, BG = black greasewood, DS = desert shrub, B/R = basin/exposed rock, SB = saltbush, SR = shrub-dominated riparian, MG = mixed grass prairie, UP = unvegetated playa, PJ = small pockets of pine and/or juniper woodland, UB = ubiquitous, P/R = pond/riparian, FT = fly through.

[6] Species has been documented breeding within latitude 41°, longitude 107-109° (Dorn and Dorn 1990; WGFD 1992).

[7] Documentation of historical observation only (WGFD 1992; WNDDB 1995).



Map D-2.2 Sections with Current and/or Historic Prairie Dog Colonies, Continental Divide/Wamsutter II Natural Gas Project Area, Sweetwater and Carbon Counties, Wyoming, 1999.

D-2.2.2.3 Mountain Plover

Suitable mountain plover habitat (i.e., areas with vegetation less than 6 inches high) within 656 ft (200 meters) of proposed disturbance areas (as identified in annual wildlife reports) would be surveyed within 2 weeks of disturbance by the BLM or a BLM-approved Operator-financed Operator biologist to detect the presence of plovers (see Table D-2.3). Surveys would be conducted on these areas during the period of March 15 through August 15. If plovers are not found, no additional surveys would be conducted. If plovers are discovered, observations would continue for sufficient duration to determine if a mountain plover nest is present. If no nesting is discovered, no additional surveys would be conducted. If nesting is discovered, surveys would be conducted on and within 656 ft of areas proposed for development during the period of March 15 through July 15 no more than 14 days prior to the date that ground-disturbing activities are initiated. If development is proposed for the period of March 15 through March 31 or July 1 through August 15, a single survey would be required; however, if ground-disturbing activities are proposed for the period of April 1 through June 30, two surveys would be required. If two surveys are required, these surveys would be made at least 14 days apart, with the last survey no more than 14 days prior to the initiation of ground-disturbing activities.

D-2.2.2.4 Western Burrowing Owl

In association with APD and ROW application field reviews, prairie dog colonies and other suitable burrowing owl nesting areas (i.e., areas with large numbers of ground squirrel burrows) on and within 0.5 mi of existing and proposed disturbance areas would be searched for western burrowing owls by the BLM or a BLM-approved Operator-financed biologist during June through August to determine the presence or absence of owl nesting (see Table D-2.3). Efforts would be made to determine reproductive success.

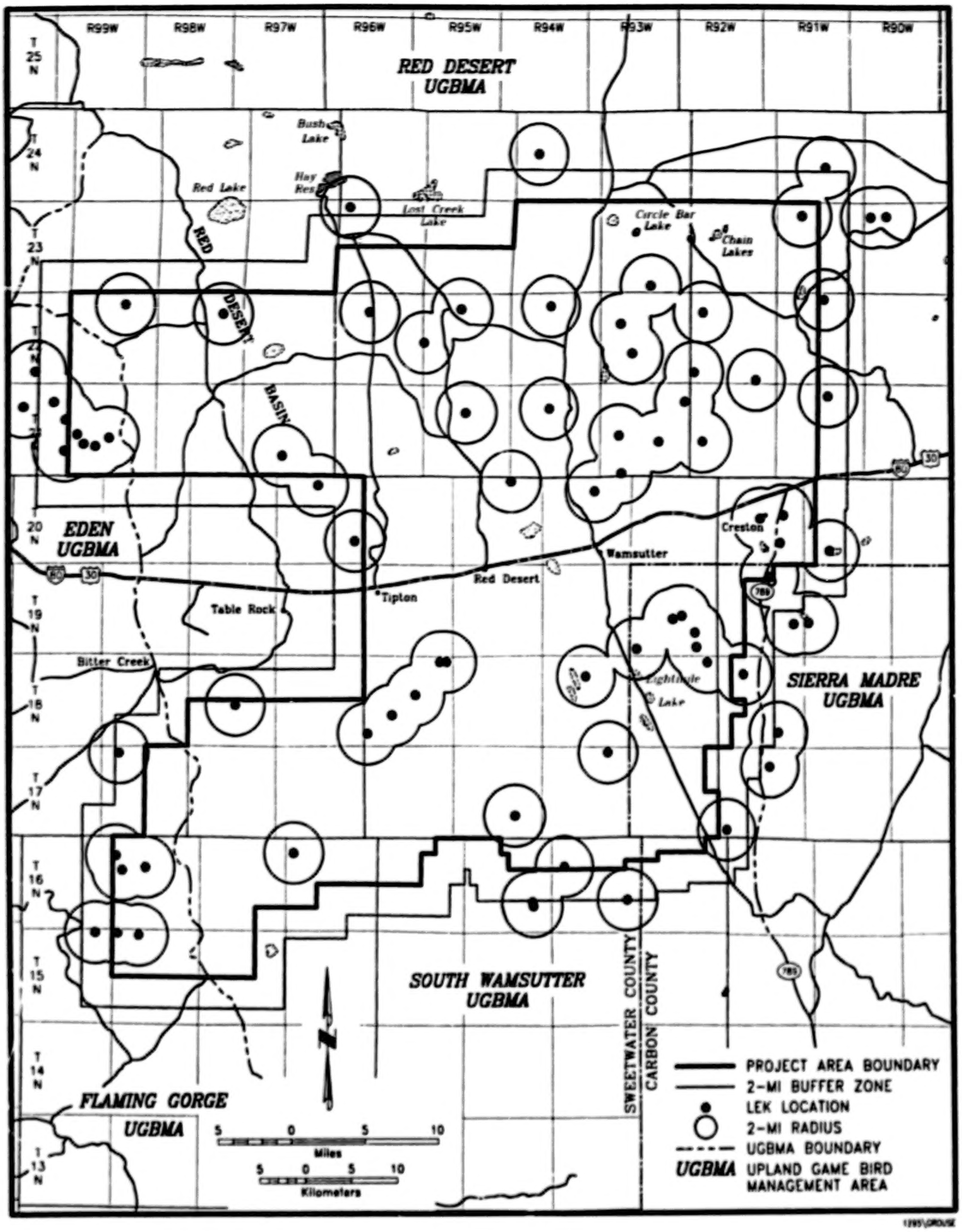
D-2.2.2.5 Other TEC&SC Species

Surveys for other TEC&SC species would be conducted by the BLM or a BLM-approved Operator-financed biologist in areas of potential habitat within 0.5 mi of proposed disturbance sites prior to disturbance (see Table D-2.3). These surveys may be implemented in conjunction with surveys for other species or as components of APD and/or ROW application processes. In addition, in areas where four or more surface locations are developed, the entire section plus a 1.0-mi buffer, as well as selected undeveloped comparison areas, would be surveyed annually during spring and summer by a BLM-approved Operator-financed biologist for selected TEC&SC species (see Table D-2.2). If any TEC&SC species are observed, the observations would be noted on appropriate data forms (see Addendum D-B). In addition, when and if TEC&SC species are observed, efforts would be made to determine their activities (e.g., breeding, nesting, foraging, hunting, etc.). If any management agency (e.g., BLM, USFWS) identifies a potential for concern regarding any of these species, additional inventory and monitoring may be implemented as specified in annual reports.

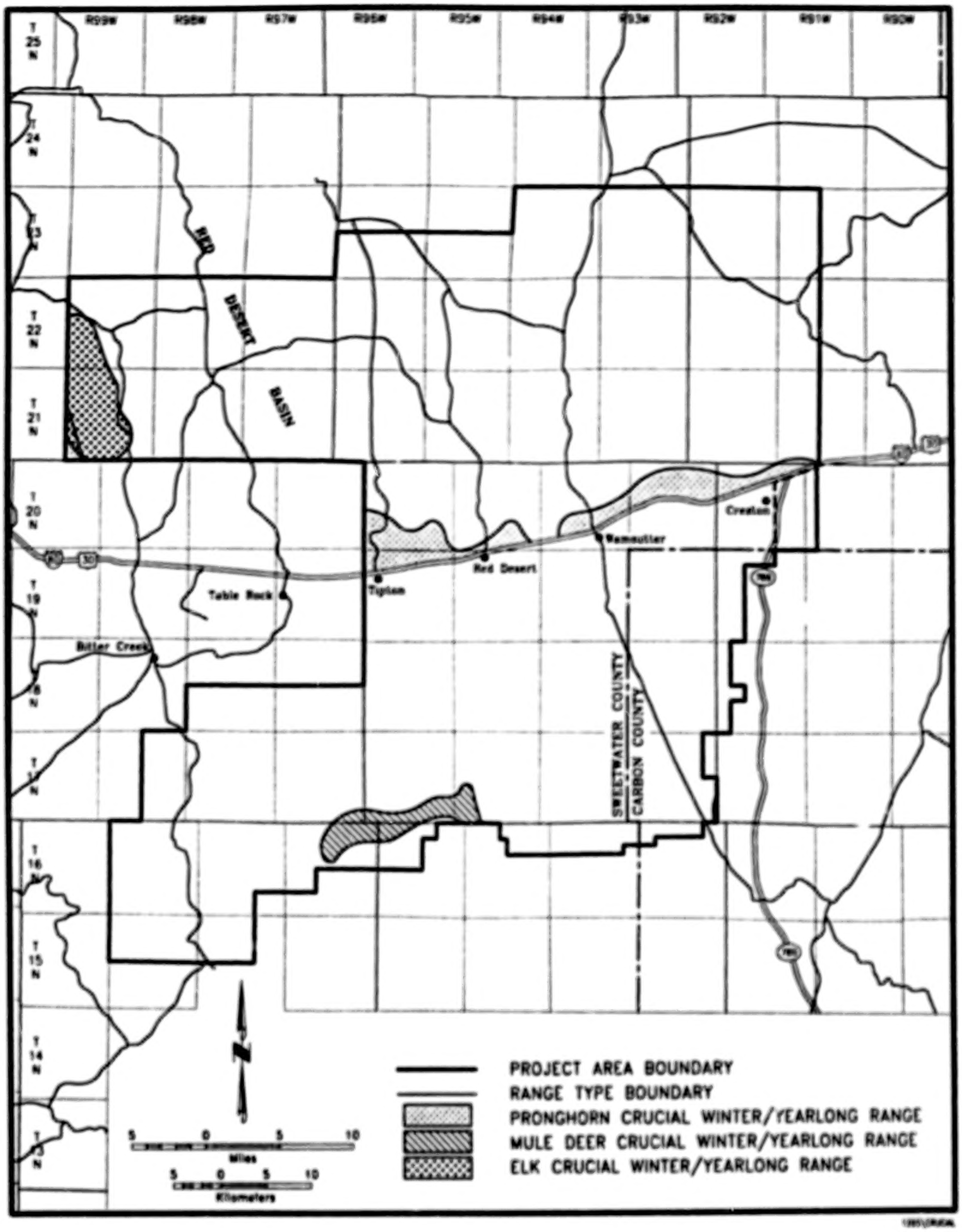
D-2.2.3 Sage Grouse

Sage grouse lek inventories would be conducted on the CD/WIIPA and a 2-mi buffer to determine lek locations every 5 years (see Table D-2.1). The approximate locations of known leks on the area are shown on Map D-2.3. Inventories would be conducted by the BLM and would be implemented two times, a minimum of 10 days apart, during March and April every fifth year of this plan. Surveys may be conducted aerially, with Operator-provided financial assistance for aircraft rental, or on the ground, as deemed appropriate by the BLM; aerial surveys would be used only to determine lek locations. In areas with four or more well locations per section, aerial inventories would be conducted annually on affected sections, 2-mi buffers, and selected undeveloped comparison areas (see Table D-2.2).

Selected leks within 2 mi of existing and proposed disturbance areas would be monitored annually to determine lek attendance by the BLM between March 1 and May 15, such that all leks on these areas are monitored at least once every 3 years (see Table D-2.1). In the event that more than four well locations occur within a section the responsibility for lek monitoring would include a BLM-approved, Operator-financed biologist (see Table D-2.2). Monitoring efforts would be implemented at all leks present on affected sections, 2-mi buffers, and selected undeveloped comparison areas. The BLM would direct lek monitoring efforts (timing, locations) such that all efforts are made to have the same individuals monitor the same leks within and across years. Data collected during these surveys would be provided on Sage Grouse Lek Records or other suitable forms (see Addendum D-B).



Map D-2.3 Known Sage Grouse Lek Locations, Continental Divide/Wamsutter II Natural Gas Project Area, Sweetwater and Carbon Counties, Wyoming, 1999.



Map D-2.4 Big Game Crucial Winter Ranges, Continental Divide/Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

would generally exclude surface disturbance). The seasonal buffer distance and exclusion dates may vary, depending on factors such as nest activity status, species, prey availability, natural topographic barriers, and line-of-sight distances. Actual nest buffers for each active raptor nest would be established in annual reports.

Operators would notify the BLM immediately if raptors are found nesting on or within 1,200 ft of project facilities, and Operators would assist the BLM as necessary in erecting artificial nesting structures (ANSs), as appropriate. The use of ANSs would be considered as a last resort for raptor protection. If nest manipulation or a situation requiring a "taking" of a raptor nest becomes necessary, a special permit would be obtained from the Denver USFWS Office, Permit Section. Permit acquisition would be coordinated with the Wyoming State USFWS Office in Cheyenne and would be initiated with sufficient lead time to allow for development of mitigation. Required corresponding permits would be obtained from the WGFD in Cheyenne. Consultation and coordination with the USFWS and WGFD would be conducted for all protection activities relating to raptors.

If it is found that project activities could potentially affect raptor nesting on or adjacent to the CD/WIIPA as determined from decreased raptor productivity or nesting or documented nest abandonment or failure, ANSs may be constructed at a rate of up to two ANSs for one impacted nest, or existing degraded raptor nests may be upgraded/reinforced to minimize potential impacts. The location, design, and other pertinent data regarding ANSs or nests proposed for upgrading would be identified in annual reports, and these ANSs would be located within the nesting territory of potentially affected raptor pairs and outside of the line-of-sight or nest buffer of actively nesting pairs, where possible. Operators would be responsible for the annual maintenance of ANSs throughout the LOP. Annual ANS maintenance activities would be completed after August 1 and prior to October 15 each year, as necessary. ANSs would be placed within the nesting territories of potentially affected raptor pairs at sites sufficiently removed from development activities to minimize or avoid potential adverse effects. All ANSs on public lands would become the property of the BLM upon completion of the project.

In cases where existing project features (e.g., well locations) are located within the nest buffers of active raptor nests, no extensive maintenance activities (e.g., workovers) would be allowed during critical periods (i.e., approximately early March through mid-June). The exact dates of exclusion would be determined by the BLM and would likely vary between nests and from year to year, depending on the species present and variations in weather, nesting chronology, and other factors.

Any powerline construction would follow the recommendations of the Avian Power Line Interaction Committee (APLIC) (1994, 1996) and Olendorff et al. (1981) to avoid collisions and/or electrocution of raptors.

D-2.3.2 TEC&SC

USFWS and WGFD consultation and coordination would be conducted for all protection activities relating to TEC&SC species and their habitats. Where possible, these actions would be specified in advance in the annual reports.

D-2.3.2.1 Black-footed Ferret

In general, all prairie dog colonies on the CD/WIIPA would be avoided, where practical. If prairie dog colonies of sufficient size and burrow density for black-footed ferrets are scheduled to be disturbed, as identified in annual reports, black-footed ferret surveys of these colonies would be conducted pursuant to BLM and/or USFWS decisions made during informal consultations. Survey protocol would adhere to USFWS guidelines as established in USFWS (1989) and would be conducted by a USFWS-qualified biologist a maximum of 1 year in advance of the proposed disturbance. Reports identifying survey methods and results would be prepared and submitted to the USFWS and BLM in accordance with Section 7 of the *Endangered Species Act of 1973*, as amended, and the Interagency Cooperation Regulations. Surveys would be financed by the Operators.

If black-footed ferrets are found on the CD/WIIPA, the USFWS would be notified immediately and formal consultations would be initiated to develop strategies that ensure no adverse effects to the species. Before ground-disturbing activities are initiated in black-footed ferret habitat, authorizations to proceed must be received from the BLM, in consultation with the USFWS.

D-2.3.2.2 Bald Eagle, Peregrine Falcon, and Ferruginous Hawk

Protection protocol generally would be as described for raptors (see Section D-2.3.1). Additional measures would be applied on a species- or site-specific basis, as deemed appropriate by the USFWS and/or BLM, and specified in annual reports.

D-2.3.2.3 Mountain Plover

Mountain plover habitats (e.g., cushion plant communities, playa lakes) would be avoided where practical, and where these habitats would be disturbed, reclamation would utilize procedures designed to reestablish suitable plover habitat.

If an active mountain plover nest is observed within survey areas (see Section D-2.2.2.3), planned development activities would be delayed at least 37 days or 1 week post-hatching. If a brood of flightless chicks is discovered, planned activities would be delayed at least 7 days. Road construction and maintenance (i.e., grading) activities would be minimized from May 25 to June 30 and, where practical, no new surface-disturbing activities would be conducted from April 1 to June 30 within 656 ft of identified mountain plover concentration areas (i.e., areas where broods and/or adults have been observed in the current year or documented in at least 2 of the past 3 years).

D-2.3.2.4 Western Burrowing Owl

Other than the avoidance of prairie dog colonies and other appropriate nesting habitat, where practical (see Section D-2.3.2.1) and the avoidance of active raptor nests during the nesting period (see Section D-2.3.1), no additional species-specific protection measures are proposed.

D-2.3.2.5 Other TEC&SC Species

If, during surveys of areas within 0.5 mi of proposed disturbance sites (see Section D-2.2.2.5), nests or other crucial features for any TEC&SC species are found (e.g., loggerhead shrike nests), avoidance of these features would be accomplished in consultation and coordination with the BLM, USFWS, and WGFD. Construction activities in these areas would be curtailed until there is concurrence between BLM, USFWS, and WGFD on what activities can be authorized. Activities would, in most cases, be delayed until such time that no adverse effects would occur (e.g., after fledging).

No additional protection measures would be applied for other sensitive species potentially present on the CD/WIIPA; however, it is assumed that the protocol specified in Section D-2.3.5 for general wildlife would likely benefit TEC&SC species as well. If any management agency (i.e., BLM, WGFD, USFWS) identifies a potential for impacts to any TEC&SC species, additional measures may be implemented as specified in annual reports.

D-2.3.3 Sage Grouse

Surface disturbance and actions that create permanent and high-profile structures such as buildings and storage tanks which are suitable as raptor perches would not be constructed within 0.25 mi of sage grouse leks on and adjacent to the CD/WIIPA. In addition, power lines would not be constructed within 0.6 mi of leks, as necessary to protect leks from raptor predation. To protect nesting sage grouse, Operators would restrict construction activities between March 1 and June 30 within a 2.0-mi radius of active sage grouse leks on suitable sage grouse nesting habitat as determined during on-site reviews of proposed development areas. In addition, if an active sage grouse nest is identified in an area proposed for disturbance, surface-disturbing activities would be delayed in the area until nesting is completed, and proposed disturbance areas would be relocated, where possible, to avoid nest locations.

D-2.3.4 Big Game Species

No construction activities or extensive maintenance actions (e.g., workovers) would be conducted within big game crucial winter range on the CD/WIIPA during crucial winter periods (i.e., November 15 - April 30). No road or pipeline ROW fencing is proposed for the project; however, if ROW fencing is required, it would be kept to a minimum, and the fences would meet BLM/WGFD approval for facilitating wildlife movement. Wildlife-proof fencing would be used only to enclose reclaimed areas where it is determined that wildlife species are impeding successful vegetation establishment. Snowfences, if used, would be limited to segments of 0.25 mi or less. Project personnel would also be advised to minimize stopping and exiting their vehicles in big game winter habitat while there is snow on the ground. In addition, escape openings would be provided along roads in big game crucial winter ranges as designated by the BLM to facilitate exit of big game animals from snowplowed roads. Additional habitat protection/improvement measures may also be applied in any given year as directed by the BLM, in consultation with Operators and other agencies, and specified in annual wildlife reports.

Potential increases in poaching would be minimized through employee and contractor education regarding wildlife laws (see Section D-2.1.2). If violations are discovered on the CD/WIIPA, Operators would immediately notify the BLM, and if the violation is committed by an employee or contractor, said employee or contractor would be disciplined and may be dismissed by the Operator and/or prosecuted by the WGFD and/or USFWS.

D-2.3.5 General Wildlife

Unless otherwise indicated, the following protection measures would be applied for all wildlife species. Additional measures primarily designed to minimize impacts to other CD/WIIPA resources (e.g., vegetation and surface water resources, including wetlands, steep slopes, etc.) are identified in EIS Section 2.6.13 and Chapter 4.0, and these measures may provide additional protection for area wildlife. Additional actions may be applied in any given year to further minimize potential impacts to wildlife. These actions would be specified in annual reports.

All roads on and adjacent to the CD/WIIPA that are required for the proposed project would be appropriately constructed, improved, maintained, and signed to minimize potential wildlife/vehicle collisions and facilitate wildlife (most notably big game) movement through the CD/WIIPA. Appropriate speed limits would be adhered to on all CD/WIIPA roads, and Operators would advise employees and contractors regarding these speed limits. Some existing roads on the CD/WIIPA and surrounding transportation planning area may be reclaimed if they become redundant or closed (gated and locked) to deny unnecessary access during critical winter periods.

To protect important habitat in southwestern portions of the CD/WIIPA (i.e., ephemeral draws dominated by basin big sagebrush) areas with sagebrush greater than 3 ft tall would be avoided where possible.

Additional non-species-specific wildlife mitigations include the following.

- Reserve, workover, and flare pits and other locations potentially hazardous to wildlife would be adequately protected by netting and/or fencing as directed by the BLM to prohibit wildlife access.
- No surface water or shallow ground water in connection with surface water would be utilized for the proposed project.
- If dead or injured raptors, big game, migratory birds, or unusual wildlife are observed on the CD/WIIPA, Operator personnel would contact the appropriate BLM and WGFD offices. Under no circumstances would dead or injured wildlife be approached or handled by Operator personnel.
- Operators would implement policies designed to control poaching and littering and would notify all employees (contract and company) that conviction of a major violation could result in disciplinary action. Contractors would be informed that any intentional game law violation or littering within the CD/WIIPA could result in dismissal.

In the event that four or more locations occur on a section, further project-specific wildlife protection measures may be applied. These measures may include the installation of remote well monitoring devices at well locations to avoid unnecessary visits by Operator personnel and the installation of water and/or condensate pipelines from well locations to central processing facilities to avoid repeated trucking of condensate and water from these well locations. Additional project- and site-specific measures may be added in future years as specified in annual reports.

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ADDENDUM D-A:
EXAMPLE DATA SUMMARY TABLES

Table D-A.1 Summary of Raptor Nest Data, Continental Divide/Wamsutter II Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1999.

Nest No.	Legal Location	Status	Condition	Species (if active)	Buffer Radius	# Eggs	# Nestlings	# Fledglings	Comments (e.g., Distance to Disturbance, Potential Impacts, Mitigation)

Table D-A.2 Summary of Observations of Threatened, Endangered, Candidate, and Other Species of Concern, Continental Divide/Wamsutter II Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1999.

Species	Total # Obs.	Habitat Type[1]											Comments (suitable habitat, nests, etc.)	Potential Impacts/Mitigation
		BS	SB	MR	B/R	BG	DS	R	D	UP	SR	P/R		

[1] Indicates presence/absence.

BS = Big sagebrush
SB = Saltbush
MR = Mixed grassland
B/R = Basin/exposed rock (Badland)
BG = Black greasewood
DS = Desert shrub
R = Reclaimed
D = Disturbed
UP = Unvegetated playa
SR = Shrub-dominated riparian
P/R = Pond/riparian

Table D-A.3 Summary of Sage Grouse Lek Data, Continental Divide/Wamsutter II Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1999.

Lek No.	Legal Location	Date	Status	# Males	# Females	Distance to Disturbance/Potential Impacts/Mitigation

Table D-A.4 Summary of General Wildlife Observations, Continental Divide/Wamsutter II Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1999.

Species			**Habitat Type**[1]											**No. of Obs. by Season**[2]			
Common Name	Scientific Name	No. of Obs.	BS	SB	MG	B/R	GW	DS	R	D	UP	SR	P/R	Winter	Spring	Summer	Fall
Mammals																	
Total																	
Birds																	
Total																	
Reptiles/Amphibians																	
Total																	
Grand Total																	

[1] Indicates presence/absence.

BS = Big sagebrush
SB = Saltbush
MG = Mixed grassland
B/R = Basin/exposed rock (badland)
GW = Greasewood
DS = Desert shrub
R = Reclaimed
D = Disturbed
UP = Unvegetated playa
SR = Shrub-dominated riparian
P/R = Pond/riparian

[2] Seasons are defined as follows:

Winter = November-March
Summer = June-August
Spring = April-May
Fall = September-October

ADDENDUM D-B:
EXAMPLE DATA SUMMARY FORMS

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RAPTOR NESTING RECORD

Page __ of __

Nest Number________ Location____________________________ Habitat Type____________________

Map Location

Date first observed________________________

Initial observer________________________

Nest type________________________

Nest material________________________

Substrate________________________

Rim/tree height (m)________________________

Nest height above ground level (m)________________

Elevation________________________

Nest exposure________________________

Comments________________________

____

____

____

USGS Quad____________________________

Date	Status	Species	# adults	# eggs	# young	Observer	Comments (condition, activity of individuals, etc.)

A photo of the nest location may be provided on reverse.

RAPTOR OBSERVATION DATA SHEET

Month/year__________ Observer____________________ Type of survey________________ Page ___ of ___

Notes ____

Date	Species	# indiv. by age and sex	Location	Habitat type	Activity	Comments/weather conditions

[1] Circle any uncertain data (i.e., partial counts, uncertain age or sex) or note as unknown.

SAGE GROUSE LEK RECORD

Page ___ of ___

Lek Number________ Location__________________________ Habitat Type______________________

Map Location

Date first observed______________________________

Initial observer______________________________

Slope/topography______________________________

Elevation______________________________

Lek exposure______________________________

Comments______________________________

USGS Quad______________________________

Date	Time	Status	# males	# females	Weather conditions	Observer	Comments

GENERAL WILDLIFE OBSERVATION DATA SHEET

Month/year__________ Observer______________________ Type of survey__________________ Page ___ of ___

Notes ____

Date	Species	# indiv. by age and sex	Location	Habitat type	Activity/direction of movement	Comments/weather conditions

---

[1] Circle any uncertain data (i.e., partial counts, uncertain age or sex) or note as unknown.

RARE ANIMAL OBSERVATION FORM

Wyoming Natural Diversity Database
1604 Grand Ave., Laramie, WY 82070

Date of Survey ______________ Observers ______________________

Species Name ____

Location (Attach copy of pertinent topo map with population location shown if available)
USGS Quad ____________________________ County ______________

Township _________ Range ________ Section __________________
1/4 Sec _________ 1/4 of 1/4 Sec ______________________________

Location ____

____

____

____

Forest Service District/BLM Resource Area _____________________

____

Number of Individuals____

Phenological Condition____

Reproductive Success____

Behavioral Notes____

____

Habitat Vegetation Type____________________________________

____

Predominant Land Use ____

____

Elevation_______________

Documentation Documentation Via: Sight__ Tracks/Sign__
Songs/Calls__ Road Kill__ Other________________________________
Specimen (Collector/coll. #; where deposited) _________________

____

Photograph Taken ? ________ Identification confirmed ? ________

Additional Comments (continue on back):

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RARE PLANT SURVEY FORM

Wyoming Natural Diversity Database
1604 Grand Ave., Laramie, WY 82070

Date of Survey ______________ Observers ________________________

Species Name ____

Location (Attach copy of pertinent topo map with population location shown if available)
USGS Quad ______________________________ County ______________

Township __________ Range _________ Section __________________
1/4 Sec __________ 1/4 of 1/4 Sec __________________________

Location ____
____
____
____

Forest Service District/BLM Resource Area ______________________
____

Biology Estimated # of individuals ____________________

% Flowering ________ % Fruiting ________ % Vegetative __________

Habitat Vegetation Type ____________________________________
____
____

Associated Species ____________________________________
____
____

Aspect (N, S, NW, etc) _______ % Slope _______ Light exposure ____
Soil Moisture ________________

Soil/substrate ____
____

Elevation __________________ Size ____________________(acres)

Predominant Land Use ____________________________________
____
____

Documentation Specimen (Collector/coll. #; where deposited) ____
____

Photograph Taken ? ________ Identification confirmed ? ________

Additional Comments (continue on back):

APPENDIX E:

BIOLOGICAL ASSESSMENT

BIOLOGICAL ASSESSMENT FOR THE CONTINENTAL DIVIDE/WAMSUTTER II NATURAL GAS PROJECT THREATENED, ENDANGERED, CANDIDATE, AND SPECIES OF SPECIAL CONCERN

Prepared for

U.S. Bureau of Land Management
Rawlins Field Office
Rawlins, Wyoming

and

Rock Springs Field Office
Rock Springs, Wyoming

By

TRC Mariah Associates Inc.
Laramie, Wyoming
MAI Project 1295

April 1999

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ABBREVIATIONS AND ACRONYMS

APD	Application for Permit to Drill
APLIC	Avian Power Line Interaction Committee
BA	Biological Assessment
BFF	Black-footed ferret
BLM	Bureau of Land Management
CD/WIIPA	Continental Divide/Wamsutter II Project Area
CNHP	Colorado Natural Heritage Program
dBA	A-weighted decibel(s)
DEIS	Draft Environmental Impact Statement
EIS	Environmental impact statement
ESA	*Endangered Species Act of 1973*, as amended
FREP	Ferret Recovery Enhancement Program
ft	Foot or feet
GCIAA	General Cumulative Impact Assessment Area
GDRA	Great Divide Resource Area
GRRA	Green River Resource Area
IDT	Interdisciplinary Team
LOP	Life-of-project
mi	Mile(s)
mm	Millimeter(s)
NEPA	*National Environmental Policy Act of 1969*
Operators	Amoco Production Company, Union Pacific Resources Company, Snyder Oil Corporation, Yates Petroleum, and other companies
RFO	Rawlins Field Office
RMP	Resource Management Plan
ROW	Right-of-way
RSFO	Rock Springs Field Office
SRA	Sensitive Resource Area
TEC&SC	Threatened, endangered, candidate, and other species of special concern
USDI	U.S. Department of the Interior
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
VRM	Visual Resource Management
WGFD	Wyoming Game and Fish Department
WNDDB	Wyoming Natural Diversity Database
WOS	Wildlife Observation System
WSA	Wilderness Study Area

E-1.0 INTRODUCTION

The Continental Divide/Wamsutter II Natural Gas Project, as proposed by Amoco Production Company, Union Pacific Resources Company, Snyder Oil Corporation, Yates Petroleum, and other companies (hereafter referred to as the Operators), would involve the expansion of natural gas exploration and development operations in and adjacent to existing developed oil and gas fields in south-central Wyoming, as discussed in the environmental impact statement (EIS) for the Continental Divide/Wamsutter II Natural Gas Project. This Biological Assessment (BA) discusses the potential effects of the proposed project on federal plant and animal threatened, endangered, candidate, and other species of special concern (TEC&SC) occurring on or adjacent to the Continental Divide/Wamsutter II Project Area (CD/WIIPA) and surrounding General Cumulative Impact Assessment Area (GCIAA) (see Maps 1.1 and 4.1 in the EIS) (Table E-1.1). In addition, this BA presents requirements to assure that the construction and subsequent operation of the proposed project on federal lands would neither jeopardize the continued existence of these species nor result in the destruction or adverse modification of their critical habitats. Analysis of effects of this proposed project on federally listed TEC&SC ensures compliance with the provisions of the *Endangered Species Act of 1973* (ESA), P.L. 93-205 (87 Stat. 884), as amended.

TEC&SC are those that have been specifically designated as such by the U.S. Fish and Wildlife Service (USFWS). Threatened species are those that are likely to become endangered in the foreseeable future throughout all or a significant portion of their ranges. Endangered species are those that are in danger of extinction throughout all or a significant portion of their ranges. Candidate species (former Category 1 candidate species) are those for which the USFWS has sufficient data to list as threatened or endangered, but for which proposed rules have not yet been issued. Species of special concern (former Category 2 candidate species) are those that may warrant designation as candidate species but sufficient data are not currently available for such a designation decision; these species are also referred to as "special status species" by the Bureau of Land Management (BLM) and "species at risk" by the USFWS (USFWS 1995a).

Critical habitat for a threatened or endangered species includes: 1) the specific locations within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of Section 4 of the ESA, on which are found those physical or biological features (a) essential to the conservation of the species and (b) which may require special management considerations or protection; and 2) specific areas outside the geographical area occupied by the species at the time it is listed, upon a determination by the Secretary (i.e., Interior, Commerce, or Agriculture) that such areas are essential for the conservation of the species.

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Table E-1.1 Threatened, Endangered, Candidate, and Other Species of Special Concern and Their Potential for Occurrence on the CD/WIIPA, Sweetwater and Carbon Counties, Wyoming, 1999.[1]

Species		Federal Status[2]	Potential Occurrence on CD/WIIPA[3]
Common Name	**Scientific Name**		
MAMMALS			
Black-footed ferret	***Mustela nigripes***	**E**	**X**
Long-eared myotis (bat)	***Myotis evotis***	**SS**	**R**
Long-legged myotis (bat)	***Myotis volans***	**SS**	**R**
Pale Townsend's big-eared bat	***Plecotus townsendii pallescens***	**SS**	**U**
Pygmy rabbit	***Brachylagus idahoensis***	**SS**	**X**
Small-footed myotis (bat)	***Myotis ciliolabrum***	**SS**	**U**
Swift fox	***Vulpes velox***	**C**	**U**
BIRDS			
Bald eagle	***Haliaeetus leucocephalus***	**T**	**U**
Black tern	***Chlidonias niger***	**SS**	**U**
Columbian sharp-tailed grouse	***Tympanuchus phasianellus columbianus***	**SS**	**X**
Ferruginous hawk	***Buteo regalis***	**SS**	**C**
Loggerhead shrike	***Lanius ludovicianus***	**SS**	**C**
Mountain plover	***Charadrius montanus***	**C**	**C**
Northern goshawk	***Accipiter gentilis***	**SS**	**R**
Peregrine falcon	***Falco peregrinus***	**E**	**R**
Trumpeter swan	***Cygnus buccinator***	**SS**	**R**
Western burrowing owl	***Athene cunicularia hypugea***	**SS**	**U**
White-faced ibis	***Plegadis chihi***	**SS**	**U**
REPTILES			
Eastern short-horned lizard	***Phrynosoma douglassii brevirostra***	**SS**	**C**
FISH			
Bonytail chub	***Gila elegans***	**E**	**X, DC**
Colorado squawfish	***Ptychocheilus lucius***	**E**	**X, DC**
Flannelmouth sucker	***Catostomus latipinnis***	**SS**	**X, DL, DC**
Humpback chub	***Gila cypha***	**E**	**X, DC**
Razorback sucker	***Xyrauchen texanus***	**E**	**X, DC**
Roundtail chub	***Gila robusta***	**SS**	**X, DL, DC**

Table E-1.1 (Continued)

Species		Federal Status[2]	Potential Occurrence on CD/WIIPA[3]
Common Name	Scientific Name		
PLANTS			
Big Piney milkvetch	*Astragalus drabelliformis*	SS	Unlikely
Cedar Rim thistle	*Cirsium aridum*	SS	Possible
Devil's gate twinpod	*Physaria eburniflora*	SS	Unlikely
Gibben's beardtongue	*Penstemon gibbensii*	SS	Unlikely
Large-fruited bladderpod	*Lesquerella macrocarpa*	SS	Possible
Mystery wormwood	*Artemisia biennis* var. *diffusa*	SS	Possible
Opal phlox	*Phlox opalensis*	SS	Possible
Ownbey's thistle	*Cirsium ownbeyi*	SS	Unlikely
Tufted twinpod	*Physaria condensata*	SS	Unlikely
Utes ladies' tresses	*Spiranthes diluvialis*	T	Unlikely
Wyoming tansymustard	*Descurainia torulosa*	SS	Possible

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[1] Adapted from personal communications with USFWS, Wyoming Game and Fish Department (1995), Wyoming Natural Diversity Data Base (1995, 1996, 1997), and Fertig et al. (1994).

[2] Federal status:

E = Endangered
T = Threatened
C = Candidate (proposed threatened)
SS = Special Status Species (BLM-managed, former USFWS category 2 candidate species)

[3] Species occurrence:

C = Locally common; species could occur in abundant numbers, but only in widely scattered or isolated populations. Populations or individuals probably will be encountered during construction and field operation, but only at a limited number of sites. Species could be present for a significant part of the year (e.g., breeding season, summer resident) or the entire year.
U = Uncommon; species may be present in the project area, but in such low numbers or in such small and widely scattered populations that an encounter during construction and field operation is unlikely. The species could be present for a significant part of the year (e.g., breeding season, summer resident) or the entire year.
R = Rare; species may occur in the project area for just a few days or hours (e.g., stopping over during migration), or the species has only occasionally or rarely been sighted in the project area. Encounters during construction and field operation are very unlikely.
X = Not probable; there has been no recent historical record of the species' occurrence in the project area; probability of encountering the species during construction and field operation is extremely unlikely.
DC = Downstream resident of Colorado River System.
DL = Downstream resident of Little Snake River.
Possible = Species documented in the general vicinity of the CD/WIIPA, but not within the CD/WIIPA itself.
Unlikely = Species documented in areas relatively distant from the CD/WIIPA and/or in habitats unlikely to be present within the CD/WIIPA.

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E-2.0 PROJECT DESCRIPTION

Operators propose to expand natural gas exploration and development in and adjacent to other oil and gas developments including the Greater Wamsutter Area II, Creston/Blue Gap Area, and the Mulligan Draw Area. The proposed CD/WIIPA is located approximately 25 mi west of Rawlins and 40 mi east of Rock Springs along Interstate 80, which bisects the area east to west (see Map 1.1 in the EIS). The CD/WIIPA is located generally within Townships 15 through 23 North and Ranges 91 through 99 West in Sweetwater and Carbon Counties, Wyoming. The 1,061,200-acre CD/WIIPA primarily occurs within the checkerboard land pattern that resulted from early railroad grants made by the federal government to the Union Pacific Railroad Company and includes 531,400 acres of federal land, 9,800 acres of state land, and 520,000 acres of private land. The entire CD/WIIPA is included in the analysis for this BA since development on private and state lands would likely occur in association with federal land development. The proposed project is located on lands administered by the BLM Rawlins Field Office (RFO) and Rock Springs Field Office (RSFO).

Four development scenarios are analyzed in the EIS and in this BA:

- the Proposed Action (full field development);
- Alternative A (14-acre maximum surface disturbance per federally managed section in sensitive resource areas [SRAs]) (see Map 2.3 in EIS);
- Alternative B (30-acres maximum surface disturbance per federally managed section in SRAs); and
- the No Action Alternative.

SRAs were defined during preparation of the EIS by the BLM Interdisciplinary Team (IDT) based on public and agency concerns identified during scoping and during past environmental analyses conducted in the region. SRAs include areas with stabilized sand dunes, raptor nesting concentration areas, crucial big game winter ranges, areas proximal to residential areas, Visual Resource Management Class II areas, and areas with high densities of cultural resource sites.

The project entails the development of natural gas resources in the CD/WIIPA beginning in 1999 and continuing for approximately 20 years. Well densities would vary across the CD/WIIPA and would likely range from 640 acres/well to 80 acres/well (1 to 8 wells per section) for production in areas found to be highly productive. Alternatives involving project-wide spacing patterns, the drilling and development of varying numbers of wells, the exclusion of development on all public lands in the CD/WIIPA, and developments on and adjacent to the Adobe Town Wilderness Study Area were considered but rejected for economic, environmental, and/or legal reasons.

Summary descriptions of the four alternatives are presented below; specific details of construction and production activities can be found in the EIS. Project documents and other information are located at the BLM GRRA Office in Rock Springs, Wyoming, and the GDRA Office in Rawlins, Wyoming.

E-2.1 THE PROPOSED ACTION - FULL FIELD DEVELOPMENT (3,000 WELL LOCATIONS)

Definitive predictions on the total number of wells and the timing of drilling operations are not currently possible due to the lack of natural gas exploration in much of the CD/WIIPA; however, the BLM's Reservoir Management Group and the Operators have indicated that a maximum of 3,000 wells at 3,000 well locations may be developed in the CD/WIIPA (approximately 1,500 wells or well locations on federal lands and/or federal mineral estate). Operators anticipate that fewer wells or well locations would be necessary, and in the event fewer locations are developed, decreased impacts are expected. Drilling and development would begin in 1999 and continue for approximately 20 years, with a life-of-project (LOP) of 30-50 years. Various associated facilities (e.g., roads, pipelines, power lines, water wells, disposal wells, evaporation ponds, compressor stations, gas processing facility) would also be constructed.

The Proposed Action would result in a maximum of 7,800 acres of new surface disturbance from well locations (including on-site gathering, measurement, and dehydration facilities); 1,500 mi (10,000 acres) of new roads or upgrades of existing roads; 1,500 mi (4,500 acres) of new pipeline; and approximately 100 acres of new surface disturbance from ancillary facilities (e.g., compressor stations, water disposal sites) (see Table 2.1 in EIS). Total new short-term and LOP surface disturbance resulting from the Proposed Action would be 22,400 acres and 8,300 acres, respectively. With the inclusion of existing disturbance necessary for the Proposed Action, total new short-term and LOP surface disturbance would be 33,600 acres and 15,900 acres, respectively. Total project-required new and LOP surface disturbance on federal lands and/or mineral estate in the CD/WIIPA is estimated to be approximately 50% of the total CD/WIIPA surface disturbance or 16,800 acres and 7,950 acres, respectively.

E-2.2 ALTERNATIVE A - 14-ACRE MAXIMUM SURFACE DISTURBANCE PER FEDERALLY MANAGED SECTION IN SRAs

Surface disturbance throughout the entire CD/WIIPA resulting from Alternative A would be similar to that from the Proposed Action, except that long-term LOP surface disturbance and associated impacts would likely be reduced on federal lands in SRAs (see Table 2.2 in the EIS). It is assumed that reductions in the level of LOP surface disturbance would result in reductions in overall disturbance (both direct and indirect) to most sensitive resources. Approximately 27% of the CD/WIIPA is within SRAs (see Map 2.3 in the EIS), and under Alternative A, a maximum of 14 acres of surface disturbance would be allowed at any one time on any federally managed section (surface and/or mineral estate) within SRAs. The 14-acre maximum surface disturbance criteria was developed by the BLM based on public, agency, and resource specialist concerns regarding potential impacts to sensitive resources from natural gas field developments. The 14-acre criteria would allow Operators to explore for natural gas throughout the entire CD/WIIPA, but would require notable changes in operational procedures for field developments within SRAs. Under this alternative, Operators would be able to explore their leases within SRAs (e.g., one well location per section) and to develop a limited number of additional locations (e.g., from one to three) depending upon the extent of new surface disturbance and associated reclamation status (see Table 2.2 in the EIS).

Surface disturbance limitation requirements would apply to all future oil and gas development activities conducted on federal lands in SRAs. To accommodate surface disturbance limitation requirements, Operators may limit surface disturbance through:

- operational changes (e.g., directional drilling; multiple wells per pad; modified location, road, pipeline, and/or ancillary facility design; use of surface pipelines; delaying construction/drilling operations until all unnecessary project-required federal surface disturbances are reclaimed);
- selection of alternative locations for ancillary facilities (e.g., outside SRAs or off federal surface); and/or
- reclamation of unnecessary existing surface disturbance on their lease (e.g., two-track roads).

The BLM, in consultation with other appropriate individuals, agencies, and land user groups (e.g., permittees, Wyoming Game and Fish Department [WGFD], USFWS), may modify surface disturbance limitation requirements if the Operators can show that alternative operational procedures would provide greater protection for sensitive resources than would limiting surface disturbance. For example, the use of pipeline collection/distribution systems for condensate, drilling water, and/or produced water, which would temporarily increase overall ground surface disturbance, may in some instances be preferable since their use could result in a decrease in the level of human activity along access roads and at well locations; thereby reducing indirect impacts associated with animal displacement. In addition, remote sensing devices could be installed at well locations to further reduce human activity levels.

Total new area-wide short-term surface disturbance for this alternative could be the same as for the Proposed Action. However, total maximum long-term (LOP) disturbance on federally managed sections in SRAs would be reduced (see Table 2.2 in the EIS), since newly disturbed areas must be reclaimed prior to the initiation of further surface disturbing activities. Some increase in the extent of surface disturbance on private or state lands within

SRAs and on federally managed lands outside of SRAs would likely occur under this alternative.

E-2.3 ALTERNATIVE B - 30-ACRE MAXIMUM SURFACE DISTURBANCE PER FEDERALLY MANAGED SECTION IN SENSITIVE RESOURCE AREAS

Area-wide surface disturbance resulting from Alternative B would be similar to that for the Proposed Action and Alternative A, except that surface disturbance and associated impacts would likely be increased on federal lands in SRAs from that occurring under Alternative A and reduced from that occurring under the Proposed Action (see Table 2.2 in the EIS). Maximum new surface disturbance per federal section would be limited to 30 acres at any one time within SRAs. The 30-acre maximum surface disturbance limitation was developed via the same means as that described for Alternative A and allows Operators to develop natural gas resources within SRAs at a level intermediate between Alternative A and the Proposed Action. Under this alternative, Operators would be able to explore and conduct limited development of their leases within SRAs (e.g., from two to eight locations per section) depending upon the extent of new surface disturbance and associated reclamation status (see Table 2.2 in the EIS). To protect federal natural gas reserves within SRAs from drainage, these reserves may be developed regardless of reclamation status.

Total new short- and long-term surface disturbance throughout the CD/WIIPA under this alternative could be the same as that for the Proposed Action; however, there would likely be reductions in the level of long-term surface disturbance on federally managed lands in SRAs. Some increase in the extent of surface disturbance on private or state lands within SRAs and on federally managed lands outside of SRAs would likely occur under this alternative.

E-2.4 NO ACTION

A No Action Alternative must be considered in all *National Environmental Policy Act of 1969* (NEPA) documents. Under the No Action Alternative, the BLM would deny further natural gas development on federal lands in the CD/WIIPA as currently proposed by the Operators. Denial of the current development proposal is not, however, a denial of all natural gas development in the area. Development of lands in the CD/WIIPA likely would occur at levels similar to those that have occurred on the area in the past and would occur as authorized by existing management directives contained in RMPs. Site-specific NEPA analyses would be conducted for all development activities on public lands or mineral estates.

For the purpose of this analysis, the No Action Alternative assumes that lands in the CD/WIIPA would be developed for natural gas production at approximately the same rate as has occurred previously. This assumption is highly speculative, since all federal lands within the CD/WIIPA have been leased for oil and gas production or are available for lease, the area is rated as suitable for gas production in the GRRA and GDRA RMPs, and accelerated development of the area has been proposed. The selection of the No Action Alternative in the EIS would not preclude natural gas development in the area.

An estimated 845 well locations would be built, 422 mi of road would be constructed or upgraded, 422 mi of pipeline would be laid, and 100 acres of new surface disturbance would be required for ancillary facilities, resulting in a maximum of 6,400 acres of new surface disturbance and 2,400 acres of long-term surface disturbance (see Table 2.1 in the EIS). With the inclusion of all existing surface disturbances on the CD/WIIPA, total new and long-term surface disturbance under the No Action Alternative would be 24,800 acres and 17,200 acres, respectively, and it is estimated that approximately 50% of this disturbance would be on federally managed lands.

Most leases in the CD/WIIPA contain various stipulations addressing surface disturbance, steep slopes, wildlife, and other matters of concern. These stipulations would allow the BLM to preclude development in certain areas (e.g., where slopes exceed 25%) or at certain times of the year (e.g., to protect big game crucial winter habitat) if operations cannot be acceptably mitigated. However, there is no stipulation, such as a No Surface Occupancy stipulation, that would allow the BLM to preclude drilling operations everywhere on a lease at all times of the year. If any one of the stipulations cannot be acceptably implemented and impacts mitigated, than an exception would not be granted. A decision, therefore, of no action, as authorized by the leases, would only be considered, given one of the following conditions.

- If there were no acceptable means of mitigating significant adverse impacts to stipulated surface resource values, then this would trigger denial of the Application for Permit to Drill (APD) and require consideration and analysis of another alternative(s). Effectively, exception(s) to one or more of the lease stipulations would not be approved.

- If the USFWS concluded that the Proposed Action and alternatives would likely jeopardize the continued existence of threatened or endangered plant and animal species, then the APD and lease development may be denied in whole or in part.

This BA will help to determine whether the proposed project meets the second condition.

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E-3.0 METHODS

A list of TEC&SC animal and plant species that potentially occur on or adjacent to the project area and associated GCIAA (see Map 4.1 in the EIS) was compiled from several sources, including a letter from the Wyoming State Supervisor's Office of the USFWS (1995b, 1997), the WGFD Wildlife Observation System (WOS) records (WGFD 1995), the Nature Conservancy's Wyoming Natural Diversity Database (WYNDDB) (1995, 1996, 1997), and the Nature Conservancy's Colorado Natural Heritage Program (CNHP) (1995). All TEC&SC species in the region are discussed in Chapter E-6.0 of this BA.

Information pertaining to the listed TEC&SC animal and plant species was gathered from the above sources and from published literature. Further site-specific information pertaining to these species will be gathered as part of APD and right-of-way (ROW) application processes, and the potential impact of a given construction site on a particular species will be determined as part of APD and ROW application reviews. The purpose of this BA is to provide a project-wide assessment of potential impacts to the listed TEC&SC species.

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E-4.0 PROJECT-WIDE MITIGATION MEASURES FOR TEC&SC SPECIES

This section provides some of the measures that would be utilized to avoid, minimize, or mitigate potential impacts to TEC&SC species associated with implementation of the proposed CD/WIIPA. Additional environmental protection measures designed specifically for other resources present on the area (e.g., soils, vegetation, wetlands, visual resources) are given in Section 2.6.13 of the EIS. These measures apply to both the Proposed Action and the two development alternatives. Project-wide mitigation measures may be waived on a case-by-case basis by the BLM if a thorough analysis determines that the resource(s) for which the measure was developed would not be impacted. Further site-specific mitigation measures would be identified during APD and ROW application review processes. To ensure compliance with mitigation measures presented in this BA and in APDs and ROW applications, each Operator would provide a qualified individual available during construction/drilling operations. This individual would consult with the BLM on a case-by-case basis as necessary during field development.

All of the proposed applicant-committed mitigation/environmental protection measures identified in Section E-4.1 would be implemented on all federal lands under all alternatives except No Action. Implementation of these measures on state and private lands would be subject to landowner preferences and agreements with individual Operators, and where these measures are not implemented, additional impacts/adverse effects could occur. Development activities on all lands, including those implemented under No Action, would be conducted in accordance with all appropriate federal, state, and county laws, rules, and regulations. General mitigation measures for TEC&SC species on the CD/WIIPA are presented below.

E-4.1 APPLICANT-COMMITTED MEASURES

1. Well locations, access roads, pipelines, and ancillary facilities would be selected and designed to minimize disturbances to areas of high wildlife habitat value (e.g., prairie dog colonies, cushion plant communities, playa lakes, wetlands and riparian areas).
2. Areas with high erosion potential and/or rugged topography (i.e., steep slopes [>25%], stabilized sand dunes, floodplains, erosive and sandy soils) would be avoided, where possible, or specialized mitigation measures would be applied.
3. All Operator-constructed roads not required for routine operation and maintenance of producing wells or ancillary facilities would be reclaimed as directed by the BLM, State Land Board, or private landowner. As necessary, these roads would be permanently blocked, recontoured, reclaimed, and revegetated by Operators, as would disturbed areas associated with permanently plugged and abandoned wells.
4. Removal or disturbance of vegetation would be minimized through construction site management (e.g., by utilizing previously disturbed areas, using existing ROWs, designating limited equipment/materials storage yards and staging areas, scalping, etc.)
5. Reserve, workover, and evaporation/production pits potentially hazardous to wildlife would be adequately protected (e.g., netted, fenced) to prohibit wildlife access as directed by the BLM, to ensure protection of migratory birds and other wildlife.
6. Any power line construction would follow recommendations by Avian Power Line Interaction Committee (APLIC) (1994, 1996) and Olendorff et al. (1981) to avoid collisions and electrocution of raptors and other avifauna.
7. USFWS and WGFD consultation and coordination would be conducted as necessary for all mitigation activities related to raptors and TEC&SC species (and their habitats), and all permits required for management, removal, and/or establishment of raptor nests would be obtained.
8. Proposed disturbance within 1.0 mi of identified raptor nests would be surveyed by a qualified biologist to determine activity status prior to commencement of drilling and construction during raptor nesting

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periods. If an active raptor nest is identified within 0.25 mi to 1.0 mi (depending upon species and line of sight) of a proposed disturbance site, Operators would restrict construction during the nesting season for that species. Additional mitigations for nesting raptors would be designed on a site-specific basis, as necessary, in consultation with the BLM, USFWS, and WGFD. Operators would notify the BLM immediately if raptors are found nesting on project facilities and would assist the BLM as necessary in erecting artificial nesting structures.

9. Operators would internally enforce existing drug, alcohol, and firearms policies.
10. All production facilities (e.g., compressors) would be muffled and maintained to minimize noise levels.
11. To minimize wildlife mortality due to vehicle collisions, Operators would advise project personnel regarding appropriate speed limits on the CD/WIIPA.
12. To protect plant populations and wildlife habitat, project-related travel would be restricted to established project roads; no off-road travel would be allowed.
13. Potential impacts to fisheries would be minimized by using proper erosion control techniques (e.g., water bars, jute netting, rip-rap, mulch). Construction within 500 ft of open water and 100 ft of intermittent or ephemeral channels would be avoided, where possible, and stream crossings for roads and pipelines would be constructed during the period of lowest flow (i.e., late summer or fall). All required stream crossings would be constructed perpendicular to flow, where possible. No surface water or shallow ground waters in connection with surface waters would be utilized for the proposed project (see EIS Section 4.1.7.1).
14. Operators would finance site-specific surveys for TEC&SC plant species prior to any surface disturbance in areas determined by the BLM to contain potential habitat for such species (BLM Directive 6840). These surveys would be completed by a qualified botanist as authorized by the BLM, and this botanist would be subject to BLM's special status plant survey policy requirements. Data from these surveys would be provided to the BLM, and if any TEC&SC plant species or their habitats are found, BLM recommendations for avoidance or mitigation would be implemented. Minor relocation of project facilities would be made to avoid TEC&SC plant species and/or their habitat. If avoidance is not possible, informal consultation with the USFWS would be initiated, as necessary.
15. Herbicide applications would be kept at least 500 ft from known TEC&SC plant populations.
16. Site-specific surveys for TEC&SC animal species would be conducted prior to disturbance in areas determined by the BLM to contain potential habitat for such species. These surveys would be completed by the BLM and/or BLM-authorized biologist during on-site inspections of proposed ROWs and well locations prior to disturbance. Surveys would focus on those TEC&SC animal species known to occur on the CD/WIIPA, as well as those potentially occurring in the area. Data from these surveys would be provided to the BLM. If TEC&SC animal species or their habitats are found on the area, construction activities would be delayed and the BLM, USFWS, and WGFD would be consulted to determine appropriate avoidance and/or protection measures. Habitats where TEC&SC animal species are likely or are known to occur would be avoided where possible through minor relocations of project facilities. If avoidance is not possible, informal consultation with the USFWS would be initiated as necessary.
17. Mountain plover habitats (e.g., cushion plant communities, playa lakes) would be avoided, where practical, and where these habitats would be disturbed, reclamation would utilized procedures designed to re-establish suitable plover habitat. Furthermore, mountain plover surveys would be conducted within suitable plover habitat on the CD/WIIPA by a qualified biologist in accordance with USFWS guidelines and as directed by the BLM. The survey procedures would include the following.

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- Visual observation of areas within 656 ft (200 meters) of proposed disturbance would be made from stationary vehicles and/or all terrain vehicles to detect the presence of plovers. All plovers located would be observed long enough to determine if a nest is present.
- Surveys would be conducted no more than 14 days prior to the date actual ground-disturbing activities begin. If two surveys are required, they would be made at least 14 days apart, with the last survey no more than 14 days prior to the start-up date.
- The number of surveys required to clear a site for mountain plovers prior to beginning a planned activity depends on the start-up date, as shown below.

Date of Planned Activity	# Surveys Required
March 15 - March 31	1
April 1 - June 30	2
July 1 - August 15	1

- If an active plover nest is found in the survey area, the planned activity would be delayed at least 37 days, or 1 week post-hatching. If a brood of flightless chicks is observed, activities would be delayed at least 7 days.
- Road construction and maintenance (i.e., grading) activities would be minimized from May 25 to June 30.
- Where practical, no new surface-disturbing activities would be conducted from April 1 to June 30 within 656 ft (200 m) of identified mountain plover concentration areas (i.e., areas where broods and/or adults have been observed in the current year or documented in at least 2 of the past 3 years.

18. Prairie dog colonies that meet black-footed ferret habitat size and burrow density criteria (USFWS 1989) would be avoided where practical.
19. Operators would consult with the USFWS and/or the BLM to determine if black-footed ferret searches are required. If ferret searches are required, they would be conducted no more than 12 months prior to construction by Operator-financed USFWS-approved biologists pursuant to USFWS guidelines (USFWS 1989).
20. All wildlife inventory, monitoring, and protection measures specified in the Wildlife Protection Plan (see EIS Appendix D) would be implemented.

E-4.2 ADDITIONAL BLM-REQUIRED MEASURES

Pursuant to Instruction Memorandum No. WY-99-24, the BLM would implement or require further protection measures for TEC&SC species as shown in Table E-4.1. Additionally, the BLM may recommend that the Wyoming Oil and Gas Conservation Commission and State Land Board adopt policies to ensure ESA compliance during well permitting on state and private lands.

Table E-4.1 BLM Requirements for Inventory, Monitoring, and Protection of Threatened, Endangered, Candidate, and Species of Special Concern, Continental Divide/ Wamsutter II Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 1999.

Land Status	BLM Requirements[1]
BLM surface/BLM subsurface	Conduct data gathering and avoid or mitigate impacts as appropriate.
BLM surface/non-BLM subsurface	Conduct data gathering and avoid or mitigate impacts as appropriate.
Non-BLM surface/BLM subsurface[2]	Request landowner permission to access lands for inventory and, if granted, conduct data gathering on affected areas and require avoidance or mitigation of impacts, as appropriate. If permission is not granted, the BLM would require Operators to obtain access through appropriate legal action and, if obtained, conduct data gathering on affected areas and avoid or mitigate impacts, as appropriate. If legal access is not obtained, no on-site data gathering would be conducted, and all analyses would be done using alternate methods and so stated in the appropriate analysis document. If it is suspected that TEC&SC species or their critical habitats may be affected, the USFWS would be notified.
Non-BLM surface/non-BLM subsurface and non-BLM surface/BLM subsurface[3]	Request landowner permission to access lands for inventory and, if granted, conduct data gathering on affected areas and require avoidance or mitigation of impacts, as appropriate. If permission is not granted, no on-site data gathering would be conducted and all analyses would be done using alternate methods and so stated in the appropriate analysis document. If it is suspected that TEC&SC species or their critical habitats may be affected, the USFWS would be notified.

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[1] The BLM may also require Operators to obtain appropriate TEC&SC species resource data.

[2] For actions that are a direct result of the subsurface estate value (e.g., oil and gas exploration and development).

[3] For actions that are not a direct result of the subsurface estate (e.g., ROWs).

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E-5.0 SPECIES ACCOUNTS

This chapter presents a discussion of the status, habitat, potential effects, and mitigation for TEC&SC animal and plant species that may occur in the CD/WIIPA and surrounding area. A summary of the potential effects and mitigations is presented in Table 5.1. Further detail on project and cumulative impacts to vegetation and wildlife is provided in EIS Sections 4.2.1, 4.2.2, 4.2.3, and 4.2.5.

E-5.1 MAMMALS

E-5.1.1 Black-footed Ferret

E-5.1.1.1 Current Status and Habitat Use

The black-footed ferret (BFF), a federal endangered species, was once distributed throughout the high plains of the Rocky Mountain and western Great Plains regions (Forrest et al. 1985). Prairie dogs are the main food of BFFs (Sheets et al. 1972), and few BFFs have been historically collected away from prairie dog colonies (Forrest et al. 1985). BFFs were considered extinct until a small population was discovered near Meeteetse, Wyoming, in 1981. Following outbreaks of distemper, surviving BFFs were brought into captivity and a captive breeding program was initiated (USFWS 1988). BFFs were reintroduced in the Shirley Basin of central Wyoming in 1991; this reintroduction effort continues with the aid of annual supplemental releases.

Two BFF sightings and the discovery of a partially buried BFF skull have been recorded within the CD/WIIPA (WGFD 1995; WNDDB 1995). In July 1972, two young ferrets were observed in the central portion of the CD/WIIPA about 5 mi south of Interstate Highway 80 (WNDDB 1995). On August 14, 1975, a BFF was observed in saltbush habitat in the northern portion of the CD/WIIPA (WGFD 1995). The most recent evidence of BFF occurrence within the CD/WIIPA, a partially buried skull, was found in August 1981. This BFF skull was discovered in a white-tailed prairie dog town along the northeastern border of the CD/WIIPA and appeared to be quite weathered (WNDDB 1995). Seven additional BFF observations have been recorded within the GCIAA, with the latest of these occurring in June 1977, about 5 mi north of Rawlins along State Highway 287.

The CD/WIIPA does not overlap any designated BFF management areas, and it is very unlikely that ferrets currently inhabit the CD/WIIPA. No evidence of BFF occupation has been documented in the CD/WIIPA for approximately 15 years.

E-5.1.1.2 Potential Effects

At present, it is anticipated that there would be no effect to this species due to the Proposed Action or alternatives because BFFs are unlikely to occur in the area, and mitigation measures for BFFs would be applied.

The proposed project would likely have only negligible additional impacts, if any, to the cumulative effects on BFF habitat from ranching, mining, other oil and gas projects, and transportation and on prairie dogs from pest control and recreational shooting. However, if mitigation measures for BFFs are not applied on nonfederal lands, cumulative impacts may adversely affect BFFs and BFF habitat.

E-5.1.1.3 Mitigation Measures

Although it is very unlikely that BFFs are present in the vicinity of the proposed project, white-tailed prairie dog colonies are scattered throughout the CD/WIIPA and adjacent areas and could provide a potential prey base and habitat for BFFs. Aerial surveys of prairie dog colonies/complexes within the CD/WIIPA in 1995 and 1996 revealed that numerous prairie dog colonies are scattered throughout the CD/WIIPA (see Map 3.10 in the EIS); some of these colonies may encompass several hundred acres. If sufficient acreage and density of prairie dog colonies are present for potential BFF habitat (as defined in USFWS [1989] guidelines) in areas to be disturbed by the proposed project, a search per USFWS guidelines would be made on a site-specific basis to ensure that ferrets are not present in the area prior to construction activity. If BFFs are discovered in the CD/WIIPA, the USFWS, WGFD, and BLM would be consulted to determine the specific procedures necessary to

Table E-5.1 Summary of Potential Effects and Mitigations for Federal Threatened, Endangered, Candidate, and Special Concern Animal and Plant Species and Their Habitats On and Adjacent to the CD/WIIPA, Sweetwater and Carbon Counties, Wyoming, 1999.

Species	Level of Impact to Species[1]	Level of Impact to Habitat[1]	Mitigation Measures
ANIMALS			
Black-footed ferret	1; potential resident	1; potential habitat only	Search per USFWS (1989) guidelines to ensure no ferrets are in areas to be disturbed, and consult with USFWS if ferrets are found; disturbance to prairie dog colonies (i.e., potential ferret habitat) would be minimized.
Long-eared myotis	3; rare visitor	3; preferred habitat not present	Reserve, workover, and evaporation/production pits would be adequately protected (e.g., netted), as directed by the BLM, to prohibit bat access.
Long-legged myotis	3; rare visitor	3; negligible disturbance to foraging habitats	Reserve, workover, and evaporation/production pits would be adequately protected (e.g., netted), as directed by the BLM, to prohibit bat access.
Pale Townsend's big-eared bat	3; uncommon visitor	3; negligible disturbance to foraging habitats	Reserve, workover, and evaporation/production pits would be adequately protected (e.g., netted), as directed by the BLM, to prohibit bat access.
Pygmy rabbit	3; not present	3; potential habitat only	None.
Small-footed myotis	3; uncommon visitor	3; negligible disturbance to foraging habitats	Reserve, workover, and evaporation/production pits would be adequately protected (e.g., netted), as directed by the BLM, to prohibit bat access.
Swift fox	2; potential resident	2; negligible disturbance to potential habitat	None.
Bald eagle	1; uncommon visitor	1; no known nests or roosts in CDPA; negligible disturbance to potential foraging habitat	If bald eagle roosts or active nests are found, no surface disturbance/occupancy would be allowed within 1.0 mi of active roosts or nests during periods of use.
Black tern	3; uncommon visitor	3; minimal amount of wetland habitat present	Wetland habitats would be avoided during construction.
Columbian sharp-tailed grouse	3; not present	3; preferred habitat not present (i.e., outside species known range)	None.

Table E-5.1 (Continued)

Species	Level of Impact to Species[1]	Level of Impact to Habitat[1]	Mitigation Measures
Ferruginous hawk	5; foraging birds may be displaced from disturbed areas	3; nest disturbance unlikely; potential for some displacement from foraging habitat, but overall disturbance to such habitat would be negligible	Nest searches would be conducted; no surface disturbance would be allowed within 1.0 mi of active nests during nesting season; artificial nest structures would be erected to replace nests built on ancillary structures.
Loggerhead shrike	5; nesting and foraging birds may be displaced from disturbed areas	3; negligible disturbance to nesting and/or foraging habitats	Site-specific searches for shrike nests would be conducted; nesting habitat would be avoided, where possible.
Mountain plover	4; nesting and foraging birds may be displaced from disturbed areas	2; unknown amount of potential nesting and foraging habitat would be disturbed	Disturbance to potential habitat would be minimized; site-specific searches for nesting plovers would be conducted; nesting birds would not be disturbed; construction activities may be delayed during nesting period.
Northern goshawk	3; rare visitor	3; preferred habitats not present	None.
Peregrine falcon	1; rare visitor; no known nests in the area	1; nesting habitat not present; negligible disturbance to foraging habitats	If nests are found in the area, no activity or surface disturbance would be allowed within 1.0 mi of active nests during nesting season.
Trumpeter swan	3; rare visitor	3; minimal amount of wetland habitat present	None.
Western burrowing owl	5; nesting and foraging birds may be displaced from disturbed areas	3; negligible disturbance of potential nesting and foraging habitat	Site-specific searches for nesting burrowing owls would be conducted; nesting birds would not be disturbed; construction activities may be delayed during nesting period; disturbance to prairie dog colonies would be minimized.
White-faced ibis	3; uncommon visitor	3; minimal amount of foraging habitat present	None.
Eastern short-horned lizard	5; some mortality possible during construction, but unlikely to adversely impact population health	3; negligible disturbance to habitats given the amount of adjacent potential habitat	None.
Bonytail chub	1; not present	1; no degradation of downstream waters	Proper and adequate construction techniques would be used when waterways must be crossed.
Colorado squawfish	1; not present	1; no degradation of downstream waters	Same as above.

Table E-5.1 (Continued)

Species	Level of Impact to Species[1]	Level of Impact to Habitat[1]	Mitigation Measures
Flannelmouth sucker	3; not present	3; no degradation of downstream waters	Proper and adequate construction techniques would be used when waterways must be crossed.
Humpback chub	1; not present	1; no degradation of downstream waters	Same as above.
Razorback sucker	1; not present	1; no degradation of downstream waters	Same as above.
Roundtail chub	3; not present	3; no degradation of downstream waters	Same as above.
PLANTS			
Big Piney milkvetch	3; unlikely to be present	3; outside known range	Site-specific surveys would be conducted for populations; conflict resolution with BLM and USFWS would be undertaken; potential habitat would be avoided, where possible.
Cedar Rim thistle	3; populations potentially present	3; minimal disturbance to potential habitats	Same as above.
Devil's gate twinpod	3; unlikely to be present	3; outside known range	Same as above.
Gibben's beardtongue	3; unlikely to be present	3; outside known range	Same as above.
Large-fruited bladderpod	3; populations potentially present	3; minimal disturbance to potential habitats	Same as above.
Mystery wormwood	3; populations potentially present	3; minimal disturbance to potential habitats	Same as above.
Opal phlox	3; populations potentially present	3; minimal disturbance to potential habitats	Same as above.
Ownbey's thistle	3; unlikely to be present	3; outside known range	Same as above.
Tufted twinpod	3; unlikely to be present	3; outside known range	Same as above.
Utes ladies' tresses	3; unlikely to be present	3; outside known range	Same as above.
Wyoming tansymustard	3; populations potentially present	3; minimal disturbance to potential habitats	Same as above.

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[1] Level of impact with project-wide mitigation--a relative measure of the intensity or "seriousness" of the project's impacts if only the project's general or project-wide mitigation measures were implemented.

1 = is not likely to adversely affect listed species.
2 = is not likely to adversely affect candidate species.
3 = is not likely to adversely affect species of special concern.
4 = possible adverse effects to candidate species.
5 = possible adverse effects to species of special concern.

protect the animals under established guidelines. To minimize disturbance to prairie dog colonies, project-required facilities would be located outside of prairie dog colonies, where possible.

E-5.1.2 Long-eared Myotis (Bat)

E-5.1.2.1 Current Status and Habitat Use

The long-eared myotis, a species of special concern, occurs throughout southwestern Canada, the western U.S., and Baja California (Hall 1981); it has also been observed throughout Wyoming (Clark and Stromberg 1987). This bat species is typically found in coniferous forests in mountainous areas (Barbour and Davis 1969) and is most common in ponderosa pine forests (Clark and Stromberg 1987). The feeding habits of the long-eared myotis are poorly understood, but their diet is probably composed primarily of insects since they feed well after sunset among trees and over open water (Barbour and Davis 1969; Clark and Stromberg 1987). A single observation of a long-eared myotis was recorded in September 1980, about 3 mi south-southwest of the CD/WIIPA (WGFD 1995). Due to the lack of forested habitats within the CD/WIIPA, however, it is likely that this was a migrating individual moving through the CD/WIIPA. It is anticipated that this bat species occurs only occasionally in the area for relatively short periods of time.

E-5.1.2.2 Potential Effects

Given the lack of observations and preferred habitat (i.e., coniferous forest) for the long-eared bat within the CD/WIIPA, it is unlikely that this species would be affected by the Proposed Action or alternatives. Cumulative impacts to this species or its preferred habitats would not increase as a result of the proposed project.

E-5.1.2.3 Mitigation Measures

Reserve, workover, and evaporation/production pits could be attractive to foraging bats, and potentially hazardous sites would be adequately protected (e.g., netted), as directed by the BLM, to prohibit bat access.

E-5.1.3 Long-legged Myotis

E-5.1.3.1 Current Status and Habitat Use

The long-legged myotis is a species of special concern, and is one of eight small mouse-eared bats known to occur in Wyoming. The long-legged myotis occurs throughout the western half of North America (Hall 1981) and has been reported as the most abundant mouse-eared bat species in the western U.S. (Clark and Stromberg 1987). It has been observed in a variety of habitats in Wyoming, including coniferous (e.g., Ponderosa pine) and deciduous forests, basin-prairie and mountain-foothills shrublands, and riparian areas (Clark and Stromberg 1987; WGFD 1992). The long-legged myotis roosts in tree hollows, snags, buildings, rock crevices, mines, and caves (Clark and Stromberg 1987). This species may hibernate in Wyoming during the winter and is extremely susceptible to disturbance during hibernation. Long-legged myotis feed exclusively on flying insects, especially moths.

Long-legged myotis have not been observed in the CD/WIIPA according to WNDDB and WGFD records. This lack of observations may, at least in part, be due to the nocturnal activity of this species. Long-legged myotis are known to occur in a cave in the Shirley Mountains, approximately 60 mi east-northeast of the CD/WIIPA (personal communication, January 1995, with Bob Luce, Nongame Mammal Biologist, WGFD). It is possible that this bat species occasionally forages over habitats within the CD/WIIPA; however, it is unlikely that it is a common resident or visitor in the area.

E-5.1.3.2 Potential Effects

The long-legged myotis is an unlikely visitor to the CD/WIIPA given the lack of observations for the area. Individuals of this bat species may forage over the CD/WIIPA for short periods of time, but probably roost in locations remote from the area. Therefore, it is unlikely that this species would be affected by the Proposed Action or alternatives. Potential cumulative impacts to this species or its preferred habitats would not increase as a result of the proposed project.

E-5.1.3.3 Mitigation Measures

Reserve, workover, and evaporation/production pits could be attractive to foraging bats; and these potentially hazardous sites would be adequately protected (e.g., netted), as directed by the BLM, to prohibit bat access.

E-5.1.4 Pale Townsend's Big-eared Bat

E-5.1.4.1 Current Status and Habitat Use

The pale Townsend's big-eared bat, a species of special concern, occurs in southern British Columbia, throughout most of the intermountain and Rocky Mountain regions of the western U.S., and as far south as northern Mexico (Hall 1981). This species also occurs throughout Wyoming (Clark and Stromberg 1987) and most commonly forages in desert shrublands, pinyon-juniper woodlands, and dry coniferous forests (Barbour and Davis 1969). Like many bats, this species roosts primarily in caves and abandoned mine shafts. Pale Townsend's big-eared bats have been observed in a cave in the Shirley Mountains approximately 60 mi east-northeast of the CD/WIIPA (personal communication, January 1995, with Bob Luce, Nongame Mammal Biologist, WGFD). The pale Townsend's big-eared bat is a moth specialist and hunts in flight (Clark and Stromberg 1987). Although no bats of this species have been observed on the CD/WIIPA, it is probably an occasional visitor to the area.

E-5.1.4.2 Potential Effects

Although the pale Townsend's big-eared bat may be the most likely TEC&SC bat species to inhabit and/or visit the CD/WIIPA due to its preference for habitats commonly found in the area, the probability of a big-eared bat being displaced or harmed by project construction and/or operation is relatively slight. Therefore, it is unlikely that the Proposed Action or alternatives would adversely affect this species. Also, potential cumulative impacts to this species or its preferred habitats would not increase as a result of the proposed project.

E-5.1.4.3 Mitigation Measures

Reserve, workover, and evaporation/production pits could be attractive to foraging bats, and potentially hazardous sites would be adequately protected (e.g., netted), as directed by the BLM, to prohibit bat access.

E-5.1.5 Pygmy Rabbit

E-5.1.5.1 Current Status and Habitat Use

The pygmy rabbit, a species of special concern, inhabits the Great Basin of northern Nevada, eastern Oregon, western Utah, and southern Idaho (Clark and Stromberg 1987). The population of pygmy rabbits in southwestern Wyoming is believed to be isolated from the western Utah population. The Utah population of pygmy rabbits is more than 100 mi to the west and separated from the Wyoming population by the Wasatch Mountains (Campbell et al. 1982). Pygmy rabbits in southwestern Wyoming are limited to dense tall stands of big sagebrush; this habitat is usually found along intermittent streams and occasional riparian areas in sagebrush-grasslands (Clark and Stromberg 1987; WGFD 1992). The vast majority (up to 99%) of the diet of this rabbit species consists of sagebrush, although it may include some grasses during summer.

Pygmy rabbits have been observed north and northeast of Rock Springs, Wyoming (WGFD 1995; WNDDB 1995). The closest recorded observation to the CD/WIIPA was approximately 14 mi northwest of the area and included both pellets and burrows. It is unlikely that pygmy rabbits occur within the CD/WIIPA due to their limited distribution and specific habitat preference.

E-5.1.5.2 Potential Effects

It is unlikely that the Proposed Action or alternatives would adversely affect the pygmy rabbit population in southwestern Wyoming. Since there is limited information on the exact distribution of this species within the state, an effort would be made during the APD site analysis to look for sign of pygmy rabbits (e.g., observations, burrows, pellets) on those potential sites containing large dense stands of big sagebrush. The proposed project is unlikely to increase cumulative effects on pygmy rabbit populations or their preferred habitats.

E-5.1.6 Small-footed Myotis

E-5.1.6.1 Current Status and Habitat Use

The small-footed myotis, a species of special concern, occurs throughout western North America (Hall 1981) and has been captured throughout Wyoming (Clark and Stromberg 1987). This species ranges throughout many of the habitats found in Wyoming, from sagebrush-grasslands to montane forests (Clark and Stromberg 1987; WGFD 1992). Small-footed myotis commonly roost in caves, abandoned mine shafts, rock crevices, and buildings (Barbour and Davis 1969); they are extremely tolerant of low temperatures during hibernation. The small-footed myotis feeds primarily on moths and beetles, hunts in flight, and uses sonar to locate prey. Although there are no recorded observations of this species within the CD/WIIPA, it is likely that small-footed myotis occasionally forage over the area.

E-5.1.6.2 Potential Effects

Small-footed myotis have not been observed within the CD/WIIPA, but may be potential visitors to the area. However, it is anticipated that the small-footed myotis would not be adversely affected by the Proposed Action or alternatives, and no increase in cumulative effects to this species is anticipated.

E-5.1.6.3 Mitigation Measures

Reserve, workover, and evaporation/production pits could be attractive to foraging bats, and potentially hazardous sites would be adequately protected (e.g., netted), as directed by the BLM, to prohibit bat access.

E-5.1.7 Swift Fox

E-5.1.7.1 Current Status and Habitat Use

The swift fox, a federal candidate species (proposed threatened), is a resident of the Great Plains from the northern Rocky Mountain foothills in southern Canada to western Texas (Clark and Stromberg 1987). In Wyoming, this species primarily inhabits the eastern Great Plains grasslands, occasionally utilizing agricultural lands and irrigated native meadows. Prey for the swift fox includes small mammals, insects, and birds (WGFD 1992).

Several observations of swift fox have been reported from the Chain Lakes and Luman Ranch areas of the northern CD/WIIPA (personal communication, July 15, 1995, with Greg Hiatt, Wildlife Biologist, WGFD). Many of these swift fox observations were in habitats generally considered atypical for this species (e.g., greasewood). Another observation of a swift fox occurred in 1977 west of the CD/WIIPA and GCIAA (WNDDB 1995).

E-5.1.7.2 Potential Effects

Disturbance of sagebrush-grasslands in the northern portion of the CD/WIIPA may reduce potential habitat for swift fox; however, no adverse effects to swift fox from the Proposed Action or alternatives are anticipated due to the relatively infrequent use of the area by this species and the relatively small amount of potential habitat disturbed. As a result, the proposed project would have only negligible additional effects, if any, to existing cumulative effects on swift fox habitat in the region.

E-5.2 BIRDS

E-5.2.1 Bald Eagle

E-5.2.1.1 Current Status and Habitat Use

The bald eagle is a federally threatened species that requires cliffs, large trees, or sheltered canyons associated with concentrated food sources (e.g., fisheries or waterfowl concentration areas) for nesting and/or roosting areas (Edwards 1969; Snow 1973; Call 1978; Steenhof 1978; Peterson 1986). Bald eagles forage over wide areas during the non-nesting season (i.e., fall and winter) and scavenge on animal carcasses such as pronghorn, deer, and elk. Bald eagles were only recently downlisted from a federally endangered status.

No known bald eagle nests or winter roosts are present on or within 2 mi of the CD/WIIPA; the lack of suitable nesting or winter roosting habitats within the CD/WIIPA precludes its use for such activities by bald eagles. There is only one recorded observation of a bald eagle occurring within the CD/WIIPA (WGFD 1995). Bald eagles, however, have been observed flying over and foraging throughout the GCIAA (WGFD 1995), and nests and concentrated winter roost sites occur along the Little Snake River in the southeastern portion of the GCIAA approximately 25 mi south/southeast of the CD/WIIPA. These birds tend to forage on road-killed deer in the area (personal communication, November 1993, with Bob Oakleaf, WGFD).

E-5.2.1.2 Potential Effects

Migrating bald eagles and those wintering in the Little Snake River drainage may occasionally use the CD/WIIPA for foraging; however, such use would likely be intermittent and for relatively short periods. Given this intermittent use and the lack of nesting and roosting habitat on the CD/WIIPA, it is anticipated that there would be no effect to this species from the Proposed Action or alternatives.

Cumulative impacts resulting from oil and gas development, surface mining, urban developments, and roads are unlikely to adversely affect bald eagles; some additional foraging habitat would be removed, but large areas remain available to eagles. Also, all developments (including the proposed project) would avoid winter roosts and active nests, further minimizing potential disturbance to the species.

E-5.2.1.3 Mitigation Measures

In the unlikely event that bald eagle roosting areas are found within the CD/WIIPA, a No Surface Occupancy restriction would be applied to a 1-mi buffer zone around winter roosts, and the area would be closed to surface-disturbing activities (e.g., construction, drilling) from November 1 through April 1. If an active bald eagle nest is found within the CD/WIIPA, no activity or surface disturbance would be allowed within a 1-mi radius of the nest between February 1 and July 31.

E-5.2.2 Black Tern

E-5.2.2.1 Current Status and Habitat Use

Black terns, a species of special concern, are spring and summer visitors to the U.S. which frequent marshes and aquatic areas as feeding and breeding sites (Scott 1987; Ehrlich et al. 1988; WGFD 1992). Nests are usually constructed in dense emergent vegetation, often on top of muskrat homes, floating debris, or little knolls in marshy areas (Bailey and Niedrach 1965; Ehrlich et al. 1988). Loss of wetland areas may be contributing to the decline of this species (Ehrlich et al. 1988).

The lack of extensive wetland areas within or adjacent to the CD/WIIPA may be the reason for the lack of observations of this species in the project area. There is only one recorded observation of black terns within or adjacent to the CD/WIIPA, although five additional observations of black terns have been recorded within the GCIAA (WGFD 1995).

E-5.2.2.2 Potential Effects

Because black terns are uncommon visitors to the CD/WIIPA and wetlands in the area would be avoided during construction, where possible, this species would not be adversely affected by the Proposed Action or alternatives.

E-5.2.3 Columbian Sharp-tailed Grouse

E-5.2.3.1 Current Status and Habitat Use

The Columbian sharp-tailed grouse, a species of special concern, is one of two sharp-tailed grouse subspecies found in Wyoming, the other being the plains sharp-tailed grouse. The Columbian sharp-tailed grouse is restricted to sagebrush-dominated mountain shrub communities in south-central Wyoming (Klott n.d.). In addition to sagebrush, these communities contain serviceberry, chokecherry, snowberry, bitterbrush, and rabbitbrush. Although Columbian sharp-tailed grouse were once found throughout western and southwestern Wyoming, herbicide treatments of large blocks of sagebrush/grass and mountain shrub habitats between 1950 and 1980 may have significantly reduced available habitat for these grouse.

There are no recorded observations of Columbian sharp-tailed grouse within or immediately adjacent to the CD/WIIPA. The majority of recorded observations for this species occur in the southeastern portion of the GCIAA (WGFD 1995), where the birds gather in leks during the spring breeding season.

E-5.2.3.2 Potential Effects

Columbian sharp-tailed grouse are not likely to occur within the CD/WIIPA or within 10 mi of the area. Therefore, there would be no effects to Columbian sharp-tailed grouse resulting from the Proposed Action or alternatives. Also, there would be no increase in cumulative effects to Columbian sharp-tailed grouse as a result of the proposed project.

E-5.2.4 Ferruginous Hawk

E-5.2.4.1 Current Status and Habitat Use

The ferruginous hawk is a species of special concern that breeds in semi-arid plains and intermountain areas of the Great Basin and Great Plains (Evans 1983). This species often nests on low cliffs, buttes, and cutbanks (Call 1978), as well as in juniper or sagebrush along the edges of pinyon-juniper communities. Ferruginous hawks feed primarily on small to medium-sized mammals such as jackrabbits, cottontail rabbits, ground squirrels, and prairie dogs (Sherrod 1978).

Ferruginous hawks occur throughout the CD/WIIPA and GCIAA (WGFD 1995). A raptor nest survey of a majority of the CD/WIIPA and an adjacent 1.0-mi buffer was conducted during the 1995 and 1996 breeding seasons to provide current information on the activity status of raptor nests. Of a total of 684 raptor nests observed, 524 (76.6%) were ferruginous hawk nests. The majority of active raptor nests (69.7%, 23 nests) were also those of ferruginous hawks. Most of these ferruginous hawk nests are located in the southern half and eastern/northeastern portion of the CD/WIIPA. It is likely that at least several hundred more ferruginous hawk nests occur within the entire GCIAA. Ferruginous hawks regularly use the CD/WIIPA for foraging.

E-5.2.4.2 Potential Effects

The principle threat to ferruginous hawks from project activities is disturbance during nesting. Potential conflicts between active nest sites and project-related activities would be resolved by the BLM, in consultation with the USFWS and WGFD, to ensure that minimal impacts would occur to ferruginous hawks or their nesting success.

There would be a LOP loss of 8,300 acres, or 0.8%, of potential ferruginous hawk foraging habitat within the CD/WIIPA as a result of new disturbance from the Proposed Action. LOP loss of potential foraging habitat under the two development alternatives would likely be slightly less than that under the Proposed Action. In addition, ferruginous hawks avoid areas in close proximity to human activity; the presence of workers would temporarily reduce the availability of adjacent foraging habitat on a localized basis. Ferruginous hawks do not avoid areas immediately adjacent to man-made structures if humans are not present and even build nests on active oil or gas field facilities in the region (personal communication, January 1992, with Bob Tigner, Planning and Environmental Specialist, BLM). Impacts to ferruginous hawks on the CD/WIIPA resulting from foraging habitat losses and temporary displacement may adversely affect the species under either the Proposed Action or alternative actions; however, sufficient foraging habitat in areas removed from disturbance sites would be available to support ferruginous hawks.

Reduction in ferruginous hawk prey species is not anticipated to be a major concern since disturbance would be scattered throughout the CD/WIIPA. Therefore, the reduction in prey species would occur over a relatively large number of potential ferruginous hawk territories, limiting prey reduction to negligible levels in any one territory.

Cumulative habitat loss for ferruginous hawks (i.e., foraging and nesting habitat) due to all past, proposed, and potential future developments in the region (e.g., oil and gas development, surface mining) is unknown; however, sufficient habitats remain and would remain undisturbed and available to ferruginous hawks.

E-5.2.4.3 Mitigation Measures

Although no potential conflict between active ferruginous hawk nest sites and project activity is anticipated at present, any that may arise during the project would be resolved by the BLM, in consultation with the USFWS and WGFD, to ensure that adverse impacts to the species would be minimized (see Wildlife Protection Plan, EIS Appendix D). Surveys would be conducted to document the status of ferruginous hawk nests so that appropriate protective measures are stipulated during APD and ROW reviews. Activities near active ferruginous hawk nests would be prohibited within a 1.0-mi radius or other distance (determined by the BLM) to avoid disturbing birds from February 1 through July 31.

Ferruginous hawks occasionally construct nests on well site facilities in Wyoming (personal communication, January 1992, with Bob Tigner, BLM). If ferruginous hawks nest on production/operation facilities, artificial nesting structures would be provided as directed by the BLM in consultation with the USFWS. Artificial nesting structures have been successfully used by ferruginous hawks in the region (Call and Tigner 1991). The Operators would assist in the erection of artificial nesting structures.

E-5.2.5 Loggerhead Shrike

E-5.2.5.1 Current Status and Habitat Use

In Wyoming, the loggerhead shrike, a species of special concern, inhabits sagebrush-grasslands associated with stands of pinyon-juniper and larger shrubs (WGFD 1992). These habitats provide ample open areas in which to forage for insects and small vertebrates (Craig 1978; Bystrak 1983), as well as trees and shrubs in which to build their large bulky nests (Graber et al. 1973). Declines in loggerhead shrike populations have been noted over the past 40 years, and the declines appear to be most significant near the periphery of their range (the midwest and eastern U.S.) (Bystrak 1983). Reasons for the decline are unknown; habitat changes and pesticide use may play a role.

There are numerous recorded observations of loggerhead shrikes both within and adjacent to the CD/WIIPA (WGFD 1995), and the species is a fairly common summer resident of the area (WGFD 1992). Loggerhead shrikes likely nest within the CD/WIIPA.

E-5.2.5.2 Potential Effects

There would be a LOP loss of 8,300 acres of potential loggerhead shrike foraging and breeding habitat within the CD/WIIPA as a result of new disturbance from the Proposed Action; this represents approximately 0.8% of the CD/WIIPA. LOP loss of potential foraging and breeding habitat under the two development alternatives would likely be slightly less than that under the Proposed Action. Impacts to loggerhead shrikes on the CD/WIIPA resulting from foraging and breeding habitat loss, as well as human presence, may adversely affect the species; however, it is anticipated that loggerhead shrikes would not be permanently displaced, and shrikes would probably shift their foraging activity to surrounding areas not impacted by the project.

Because of the relatively minimal amount of loggerhead shrike nesting habitat that would be disturbed by the proposed project for the LOP and the scattered nature of this disturbance, it is anticipated that the proposed project would result in minimal cumulative impacts to this species.

E-5.2.5.3 Mitigation Measures

Surveys for active loggerhead shrike nests would be implemented prior to disturbance during on-site inspections of proposed ROWs and well locations conducted as components of ROW application and APD review processes. If active loggerhead shrike nests are found in the area to be disturbed, construction activities would be rescheduled such that the birds would not be disturbed during the nesting season.

E-5.2.6 Mountain Plover

E-5.2.6.1 Current Status and Habitat Use

The mountain plover is a candidate species (proposed threatened) inhabiting the high dry short-grass plains/prairies east of the Rocky Mountains (Dinsmore 1983), as well as the sagebrush grasslands throughout Wyoming (WGFD 1997). It is also known from northern Utah and northwestern Colorado (Knopf 1996). The focus of breeding activity appears to be northeastern Colorado (Graul and Webster 1976). Parrish et al. (1993) noted that mountain plover nests in northeastern Wyoming were found in areas of short (<4 inches) vegetation on slopes of less than 3%; any short grass, very short shrub, or cushion plant vegetation type could be considered nesting habitat. In Colorado, the mountain plover diet is composed of 99.7% arthropods, with beetles, grasshoppers, crickets, and ants the most important food items (Baldwin 1971). Breeding bird surveys between 1966 and 1987 show an overall decline in the continental population of mountain plovers [U.S. Department of Agriculture, Forest Service [USFS] 1994a). Surveys completed in 1991 indicate that only 4,360 to 5,610 mountain plovers remain on the North American continent (USFS 1994b). Probably the most important reasons for the decline of the mountain plover are human impacts and habitat alteration on breeding grounds and the degradation in the quality of wintering habitats (e.g., southern Texas, California) (Knopf 1994, 1996). Loss of breeding habitat due to cultivation and prey base declines resulting from pesticide use are also threats to mountain plover survival (Wiens and Dyer 1975). Cattle often maintain the open blue grama/buffalo grass habitat favored by mountain plovers, so livestock grazing may benefit the species (Klipple and Costello 1960).

Mountain plovers have been observed throughout the CD/WIIPA and adjacent areas, and many of these observations occurred during the breeding season (WGFD 1995). Therefore, it is likely that mountain plovers not only forage within the CD/WIIPA, but also nest within the area.

E-5.2.6.2 Potential Effects

Loss of potential mountain plover breeding and foraging habitat due to proposed project activities may adversely affect the species. However, while the total extent of mountain plover habitat on the CD/WIIPA has not been defined, with the limited and scattered nature of habitat disturbance as well as proposed survey and avoidance measures, it is anticipated that this species would not be jeopardized or permanently displaced.

Cumulative impacts to the local mountain plover population would probably not jeopardize regional populations. Although disturbance due to oil and gas development, surface mining, urban developments, and roads has removed an unknown portion of potential mountain plover nesting habitat, it is unlikely that the extent of this habitat removal has jeopardized plover reproduction due to the dispersed nature of disturbance associated with oil and gas and other developments throughout the region. Therefore, displaced plovers would likely have adequate alternate habitats for foraging and nesting activities. Surface disturbance resulting from the proposed project would slightly increase cumulative impacts to mountain plovers, and such impacts are unknown for the foreseeable future.

E-5.2.6.3 Mitigation Measures

Mountain plover habitats would be avoided, where practical, and if construction within suitable mountain plover habitat (i.e., areas with low-growing vegetation) is planned between March 15 and August 15, surveys for nesting mountain plovers (i.e., a nest and/or defending pairs of adult mountain plovers) would be implemented prior to disturbance (see Section E-4.1, item 17). Surveys would be conducted during on-site inspections of proposed ROWs and well locations that are conducted as components of ROW application and APD review processes, and the USFWS would be consulted regarding effects determinations. If mountain plover nesting is found in the area, the USFWS would be consulted and construction activities would be rescheduled such that the birds would not be disturbed. Surveys would not be conducted for construction activities planned for the period August 15 through March 15.

E-5.2.7 Northern Goshawk

E-5.2.7.1 Current Status and Habitat Use

The northern goshawk, a species of special concern, inhabits coniferous forests, especially those with a significant Douglas fir and lodgepole pine component (WGFD 1992). Goshawks forage in a variety of habitats, including sagebrush-grassland areas adjacent to stands of coniferous forest. Prey includes small mammals, waterfowl, songbirds, and insects (Terres 1980). Nests are often built high (i.e., >30 ft) in coniferous trees; some goshawks have been observed nesting in mature cottonwoods along riparian corridors (Call 1978).

Although northern goshawks have been observed in pinyon-juniper habitats within the GCIAA, no goshawks have been observed within the CD/WIIPA (WGFD 1995; WNDDB 1995). While goshawks have been observed west of the CD/WIIPA (within 5 mi) (WGFD 1995), in general, habitats within the CD/WIIPA are not suitable for northern goshawk nesting or foraging.

E-5.2.7.2 Potential Effects

Since the CD/WIIPA lacks suitable northern goshawk habitat and no goshawks have been observed within the CD/WIIPA, the Proposed Action or alternatives would not adversely impact this species. Cumulative effects to northern goshawks would not increase as a result of the proposed project.

E-5.2.8 Peregrine Falcon

E-5.2.8.1 Current Status and Habitat Use

A federally endangered species, the peregrine falcon nests on tall cliffs, usually within 1.0 mi of a stream or river, or extensive brush or woodlands; these habitats provide concentrated food sources and open areas in which to hunt (Snow 1972; Call 1978). Peregrine falcons nest among substantial rock outcroppings (usually southern exposure) in small caves or on overhanging ledges large enough to accommodate three to four full-grown nestlings (Wilderness Research Institute 1979). Peregrine falcons feed almost exclusively on birds, many of which are associated with riparian zones and large bodies of water (e.g., waterfowl).

No known peregrine falcon nests occur on or within 2 mi of the CD/WIIPA, nor have any peregrine falcons been reported in the area. There is only one recorded observation of a peregrine falcon in the entire GCIAA: a single bird was observed in the eastern portion of the GCIAA in 1981 (WGFD 1995). The absence of suitable cliffs within the CD/WIIPA precludes peregrine falcon nesting, although the area may be used on occasion for hunting by wintering or migrating peregrines.

E-5.2.8.2 Potential Effects

There is no evidence that peregrine falcons regularly utilize habitats in the vicinity of the CD/WIIPA. It is expected, therefore, that implementation of the Proposed Action or alternatives would not have any substantial direct or indirect impact (i.e., adverse effect) on the peregrine falcon.

E-5.2.8.3 Mitigation Measures

In the very unlikely event that an active peregrine falcon nest is found within or immediately adjacent to the CD/WIIPA, no activity or surface disturbance would be allowed within a 1.0-mi buffer zone around the nest between February 1 and July 31.

E-5.2.9 Trumpeter Swan

E-5.2.9.1 Current Status and Habitat Use

The trumpeter swan, a species of special concern, primarily breeds and winters in eastern Canada and Alaska; the majority of the population that occurs in Wyoming frequents the marshes, lakes, and rivers in the Greater Yellowstone Ecosystem during the spring and summer months and winters in Idaho (Terres 1980; WGFD 1992). Nests are usually built on a muskrat house or small island in a large pond or small lake (WGFD 1992). Adults feed mostly in shallow water on vegetation growing on the lake bottom (Terres 1980).

A single observation of a trumpeter swan occurred approximately 7.0 mi west of the CD/WIIPA in September 1985 (WGFD 1995). This was likely a vagrant individual that temporarily stopped in the area to feed or rest. If the limited wetlands within the CD/WIIPA are used by this species at all, it is probably during rare visits by transient individuals.

E-5.2.9.2 Potential Effects

Since the CD/WIIPA, for the most part, lacks appropriate trumpeter swan habitat, it is unlikely that the Proposed Action or alternatives would adversely affect the trumpeter swan, or increase cumulative effects to this species or its habitat.

E-5.2.10 Western Burrowing Owl

E-5.2.10.1 Current Status and Habitat Use

This small long-legged owl of short-grass prairie is a species of special concern. The burrowing owl occurs throughout western North America and winters on its breeding grounds, except in the northern Great Basin and Great Plains region (Terres 1980). This owl nests in colonies, often in abandoned burrows of prairie dogs or ground squirrels (Dorn and Dorn 1990; WGFD 1992). Burrowing owls feed primarily on insects, rodents, and small birds (e.g., sparrows and horned larks) (Terres 1980). This owl hunts primarily in early evening and throughout the night.

According to WGFD (1995) and WNDDB (1995) observation records, burrowing owls have been observed throughout the CD/WIIPA and GCIAA. The most recent known observations in the region were in April 1992: a single bird was observed in Wyoming big sagebrush-grassland habitat in the central CD/WIIPA and two birds were observed in sagebrush-greasewood habitat about 1.0 mi northwest of the CD/WIIPA (WGFD 1995). It is likely that burrowing owls forage and nest within the CD/WIIPA, although burrowing owl observations have diminished over the last decade.

E-5.2.10.2 Potential Effects

It is possible that the proposed project could adversely affect western burrowing owls on the CD/WIIPA. Some potential burrowing owl foraging and nesting habitat would be disturbed due to the proposed project, although prairie dog colonies would be avoided, where possible, as part of the mitigation for black-footed ferrets and this avoidance would aid in protecting potential burrowing owl nesting habitat from extensive disturbance.

As with the mountain plover, some increase in disturbance to potential burrowing owl habitat would result in an increase in overall cumulative effects to this species. Given the dispersed nature of the disturbance and the availability of alternative habitat, cumulative impacts to the burrowing owl are unlikely to jeopardize regional populations. It should be noted, however, that burrowing owl populations in the region have experienced a decline over the last decade, and the reasons for this decline are unclear. Further research and additional protection for prairie dog colonies may assist in the stabilization, if not the recovery, of regional owl populations.

E-5.2.10.3 Mitigation Measures

If construction is planned for spring or early summer, surveys for nesting western burrowing owls (i.e., a nest and/or a territorial pair) would be implemented prior to disturbance during on-site inspections of proposed ROWs and well locations conducted as components of ROW application and APD review processes. If burrowing owl nests are found on the area, construction activities would be moved or rescheduled such that the birds would not be disturbed. Prairie dog colonies (i.e., potential burrowing owl nesting habitat) would be avoided, where possible.

E-5.2.11 White-faced Ibis

E-5.2.11.1 Current Status and Habitat Use

The white-faced ibis is a species of special concern that frequents marshes, wet-moist meadows, lake shores, and irrigated meadows (WGFD 1992). Typical prey includes insects, leeches, earthworms, frogs, and fish (Terres 1980). The species breeds in colonies ranging from a few to several thousand birds in extensive freshwater marshes sporadically distributed from the Pacific Coast to the Great Plains (Erwin 1983). Breeding colonies have been observed at Hutton Lake National Wildlife Refuge in southeastern Wyoming and several locations in southwestern Wyoming (WGFD 1992).

Although white-faced ibises have been occasionally observed within and adjacent to the CD/WIIPA, no breeding colonies occur within the area. The CD/WIIPA contains very little potential nesting habitat for the species. Ibises observed on the CD/WIIPA are likely transient individuals using the area for brief periods for resting and foraging during migration.

E-5.2.11.2 Potential Effects

Because of the lack of potential nesting habitat and low numbers of ibises that use the area, no effects to white-faced ibises are anticipated to result from either the Proposed Action or alternatives. Also, no increase in cumulative effects to this species or its habitat are anticipated due to the proposed project.

E-5.3 REPTILES (EASTERN SHORT-HORNED LIZARD)

E-5.3.1 Current Status and Habitat Use

A species of special concern, the eastern short-horned lizard is found throughout most of Wyoming below about 6,500 ft; it is especially common in sagebrush-grassland communities in the central and southwestern counties of the state. Short-horned lizards favor areas with firm soils that are relatively flat and arid (Baxter and Stone 1985). These ground dwellers forage diurnally, primarily feeding on ants and beetles, and bear their young live in relatively large litters (Baxter and Stone 1985).

Eastern short-horned lizards have been observed within both the CD/WIIPA and GCIAA (WGFD 1995). The species is probably a relatively common resident of sagebrush-grassland and short-grass habitats within the CD/WIIPA.

E-5.3.2 Potential Effects

The proposed project may adversely affect eastern short-horned lizards in the CD/WIIPA; however, the project is unlikely to jeopardize regional populations of the species. This reptile species has been observed within the CD/WIIPA, and it is likely that much of the project area represents suitable habitat for the eastern short-horned lizard. Although some disturbance of areas containing short-horned lizards would likely occur under either the Proposed Action or alternatives, overall loss of habitat for this species within the CD/WIIPA probably would be negligible (a maximum of 8,300 acres LOP, 0.8% of the CD/WIIPA). A slight increase in direct mortality of short-horned lizards may initially occur due to project construction and may remain slightly elevated for the LOP due to increased traffic.

It is anticipated that the proposed project would not significantly increase existing and foreseeable future cumulative impacts (e.g., oil and gas development, mining, recreation) to short-horned lizards and their habitat in the region (i.e., unlikely to jeopardize).

E-5.4 FISH

E-5.4.1 Bonytail Chub, Colorado Squawfish, Humpback Chub, and Razorback Sucker

E-5.4.1.1 Current Status and Habitat Use

The bonytail chub, Colorado squawfish, humpback chub, and razorback sucker are federally endangered species, and all four species are residents of the Green and Colorado River systems (USFWS 1987; Tyus and Karp 1989; Matthews 1990). Although once abundant throughout both of these river systems, all four species are now limited to reaches of river that are either relatively undisturbed or controlled to provide appropriate flows. Reservoir impoundments and water diversions are the main threats to these species.

None of these species occur within or adjacent to the CD/WIIPA; it is likely that the closest occurrence of these species is in the lower Little Snake River drainage of Colorado (Tyus and Karp 1989).

E-5.4.1.2 Potential Effects

No effect to these downstream fish species from the Proposed Action or alternatives is anticipated because of the mitigation measures described in Chapter E-4.0 of this BA (see item 13).

E-5.4.2 Flannelmouth Sucker and Roundtail Chub

E-5.4.2.1 Current Status and Habitat Use

The flannelmouth sucker and roundtail chub are species of special concern and residents of the Green and Colorado River systems (Baxter and Simon 1970; Lee et al. 1980). As with the endangered fish species described in Section 5.4.1, declines in populations of these species are attributable to stream and river degradation from impoundment and diversion projects within the Green and Colorado River systems.

Both species occur in the Little Snake River south and east of the CD/WIIPA (Baxter and Simon 1970; Johnson and Oberholtzer 1987; WNDDB 1995). Flannelmouth sucker and roundtail chub have also been observed in Muddy Creek in the southeastern portion of the GCIAA (Johnson and Oberholtzer 1987; WNDDB 1995).

E-5.4.2.2 Potential Effects

No effect to these downstream fish species from the Proposed Action or alternatives is anticipated because of the mitigation measures described in Chapter E-4.0 of this BA (see item 13).

E-5.5 PLANTS

All 11 species of the TEC&SC plants presented below are species of special concern, and Ute ladies' tresses is also listed as threatened by the USFWS. Five species could occur within the CD/WIIPA due to habitat preference or observation: Cedar Rim thistle, large-fruited bladderpod, mystery wormwood, opal phlox, and Wyoming tansymustard. The other six species (Devil's gate twinpod, Gibben's beardtongue, Big Piney milkvetch, tufted twinpod, Utes ladies' tresses, and Ownbey's thistle) are unlikely to occur within the CD/WIIPA.

Potential impacts (including cumulative impacts) to these plant species are unlikely to jeopardize regional populations, especially given adherence to mitigation measures. Mitigation measures for TEC&SC plant species would include, but are not be limited to:

- surveying areas to be disturbed prior to disturbance;
- avoiding known TEC&SC plant populations; and
- other mitigation approved by the USFWS and the BLM if avoidance is not feasible.

A brief description of the habitats of occurrence and known locations of the 11 species of special concern is presented below.

E-5.5.1 Big Piney Milkvetch

The Big Piney milkvetch, also called Bastard draba milkvetch, is a mat-forming perennial herb with flowering stems less than 2.5 cm high. This plant is characterized by pink-purple flowers less than 7 mm long and spoon-shaped to linear leaves (5-25 mm) that are covered with silvery hairs. The mature fruits, which are keeled and grooved, are required to distinguish this plant from similar species (*A. spatulatus*). While endemic to the Green River Basin, Wyoming, it has not been documented in the CD/WIIPA. It has been found flowering in May-July in sagebrush and cushion plant communities in Sublette County, Wyoming. It prefers sandstone, stony clay, badlands, and barren clay slopes and ridges at elevations of 6,900-7,200 ft above sea level (Fertig et al. 1994).

E-5.5.2 Cedar Rim Thistle

This spiny perennial forb with lavender flowers usually grows no taller than 12 inches (Fertig et al. 1994). It is endemic to the Wind River and Green River basins of central Wyoming (i.e., Fremont and Sublette Counties) and is generally found on barren chalky hills, gravelly slopes, and fine-textured sandy-shaley draws at elevations between 6,700 and 7,200 ft (Dorn 1992; Fertig et al. 1994).

Cedar Rim thistle has not been observed within the CD/WIIPA. The closest observation was about 10 mi west-northwest of the CD/WIIPA (WNDDB 1995); the thistles were in a barren steep draw of sandy clay within a dense hillside community of antelope bitterbrush (*Purshia tridentata*), rabbitbrush (*Chrysothamnus*), and mountain mahogany (*Cercocarpus montanus*).

E-5.5.3 Devil's Gate Twinpod

This prostrate perennial herb has whitish or pale yellow flowers and two-lobed inflated fruits that extend out from the main body of the plant on short stems (Fertig et al. 1994). This plant has been seen within cushion plant communities on calcareous ridges, eroded sandstone or limestone, or in soil-filled crevices in granite outcrops (Dorn 1992; Fertig et al. 1994). Devil's gate twinpod is endemic to the Sweetwater and Platte River basins in central Wyoming (Carbon, Fremont, and Natrona Counties). Devil's gate twinpod has not been observed within the CD/WIIPA; however, it has been observed along the northern and northeastern border of the GCIAA on wind-swept ridges (WNDDB 1995).

E-5.5.4 Gibben's Beardtongue

This species favors exposed outcrops of shale and sandstone with slopes of 20 to 30° on poorly developed soils. Gibben's beardtongue is subject to minimal competition from other plants (Dorn 1990; BLM 1992). Dorn (1990) found that populations of Gibben's beardtongue were stable and recommended that the status of this plant be downgraded due to the lack of potential threats. Gibben's beardtongue has not been observed within the CD/WIIPA; the closest populations of the plant occur within the GCIAA along the Wyoming-Colorado border (WNDDB 1995).

E-5.5.5 Large-fruited Bladderpod

The large-fruited bladderpod is a perennial forb with recumbent stems up to 12 inches long (Fertig et al. 1994). The flowers are tiny and yellow, and the fruit is inflated and slightly hairy. This plant is found at elevations between 7,200 and 7,700 ft on gypsum-clay hills (barren), benches, and clay flats along the western edge of the Great Divide Basin (Dorn 1992; Fertig et al. 1994).

Although the large-fruited bladderpod has been observed within the GCIAA (WNDDB 1995), it has not been observed within the CD/WIIPA. The closest observation was about 8 mi northwest of the CD/WIIPA; the plants were located on a barren clay knob (WNDDB 1995).

E-5.5.6 Mystery Wormwood

Mystery wormwood is a biennial forb with 12-inch stems that branch from the base (Fertig et al. 1994). The inflorescence is dense and spike-like, and the flower heads are small and numerous. Mystery wormwood is endemic to Sweetwater County and has been observed on clay flats and playas at about 6,500 ft in elevation (Dorn 1992; Fertig et al. 1994). Mystery wormwood has not been observed in the CD/WIIPA; the closest known population of these plants is on a clay flat about 6 mi west of the CD/WIIPA (WNDDB 1995).

E-5.5.7 Opal Phlox

Opal phlox is a low-growing perennial herb 7 cm or less in height; stems are loosely matted. Flowers are white or pink and appear from May through June. It prefers clay slopes and ridges at elevations from 6,700 to 6,900 ft. Associated vegetation includes *Artemisia pedatifida*, *Eriogonum* spp., *Arenaria hookeri*, *Atriplex gardneri*, and *Sphaeromeria argentea*. Endemic to southwest Wyoming (Lincoln, Sweetwater, and Uinta Counties), it has not been found in the CD/WIIPA, but habitat is present support this plant (Fertig 1996; Fertig et al. 1994).

E-5.5.8 Ownbey's Thistle

This spiny perennial forb grows to about 28 inches in height and possesses terminal flower heads that are white to rose-pink (Dorn 1992; Fertig et al. 1994). Ownbey's thistle is endemic to northeastern Utah, northwestern Colorado, and southwestern Wyoming (Sweetwater County). In Wyoming, it has been found on sparsely vegetated shaley slopes in juniper (*Juniperus*), sagebrush (*Artemisia*), and riparian communities along the Wyoming-Colorado border (Fertig et al. 1994). Ownbey's thistle has not been observed in either the CD/WIIPA or the GCIAA (WNDDB 1995).

E-5.5.9 Tufted Twinpod

Tufted twinpod is a perennial herb growing to 8 cm high on sparsely vegetated shale slopes and ridges from 6,500 to 7,000 ft in elevation. It has not been document in the CD/WIIPA but is endemic to southwestern Wyoming (Lincoln, Sublette, and Uinta Counties). A member of the mustard family, it is characterized by bright yellow flowers (4-7 mm long), basal silvery pubescent leaves, and inflated deeply lobed fruits. Mature fruits are required for positive identification (Fertig et al. 1994).

E-5.5.10 Utes Ladies' Tresses

Ute ladies' tresses is a perennial terrestrial orchid 20 to 50 cm in height with narrow leaves and small white or ivory flowers clustered into a spike arrangement. This orchid is endemic to moist soils near wetland meadows, springs, lakes, and perennial streams from 4,200 to 7,000 ft above sea level. Utes ladies' tresses colonize early successional riparian habitats such as point bars, sandbars, and low-lying gravelly, sandy, or cobbly edges and persist in those areas that are provided with perennial moisture. They are intolerant of shade and usually occur as small scattered groups (USFWS 1997).

The Ute ladies' tresses orchid is not known to occur in the CD/WIIPA; however, populations occur in Colorado along the Front Range, in Utah on the south side of the Uinta Mountains, and in the Niobrara, Cheyenne, and North Platte river drainages in Wyoming. It is possible that this orchid could be discovered in the project cumulative impact areas (USFWS 1997); however, with the implementation of proposed mitigation measures, the proposed project and associated cumulative impacts are unlikely to affect the species.

E-5.5.11 Wyoming Tansymustard

The Wyoming tansymustard is a tiny biennial or short-lived forb with multiple stems; stem height rarely exceeds 6 inches (Fertig et al. 1994). The flowers of this plant are tiny (1.5 mm long) and yellow, and the fruits are linear and hairy. The Wyoming tansymustard has been observed at elevations between 8,300 and 10,000 ft on sparsely vegetated sandy slopes at the base of volcanic breccia or sandstone cliffs (Fertig et al. 1994). The species is endemic to the Absaroka Mountains and the Rock Springs Uplift in Wyoming (including Fremont and Sweetwater Counties).

The Wyoming tansymustard has not been observed within the CD/WIIPA. The closest observation of this species was about 3 mi west of the CD/WIIPA along the base of a sandstone cliff with miner's candle (*Cryptantha*), phacelia (*Phacelia*), sandwort (*Arenaria*), and tufted evening primrose (*Oenothera caespitosa*) (WNDDB 1995).

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